METHOD PROTOCOL

Games to Connect Science and Policy



Requested by

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Eklipse Expert Working Group on Game to Connect Science and Policy

Members of the Expert Working Group:

Agnessa Spanellis - University of Edinburgh, UK *(Co-chair)*

Thomas-Julian Irabor - University of Liège, Belgium *(Co-chair)*

Claude Garcia - University of Applied Sciences, Bern, Switzerland *(Co-chair)*

Andrew Bell - InstiCornell University, USA

Manon Berge - ACTeon, research and consultancy, France

Sofia Chanioti - 4ENV, Greece

Sarah Crowe - Sarah Crowe Planning, UK

Daniesse Kasanoski - UMR SENS (CIRAD), France

Feng Mao - University of Warwick, UK

Erin McAuliffe - Independent researcher and consultant, Italy

Nataliya Stryametsa - NGO Danube-Carpathian Programme, Nature Reserve Roztochya, Ukraine

Miguel Trenkel-Lopez - Curieus Games CIC, UK

Alla Aleksanyan - International Scientific Educational Centre of NAS, Armenia

Aysegul Sirakaya - Abyss Consulting, Sweden

Members of the Eklipse Methods Expert Working Group:

Malavika Hosahally Narayana - Ashoka Trust for Research in Ecology and the Environment (ATREE), India

Nina V. Nygren - Häme University of Applied Sciences, Hämeenlinna, Finland

Francesco Sica - Sapienza University of Rome, Italy

Saloni Bhatia - Ashoka Trust for Research in Ecology and the Environment, India.

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Members of the Eklipse Knowledge Coordination Body:

Sonja Hölz - Bavarian Academy for Nature Conservation and Landscape Management (ANL), Germany.

Carla-Leanne Washbourne - The University of Warwick, University College London, UK

Members of the Eklipse Management Body:

Karla E. Locher-Krause - Helmholtz Centre for Environmental Research (UFZ), Germany

Marie Vandewalle - Helmholtz Centre for Environmental Research (UFZ), Germany

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1. Background

The Ecological Knowledge Games (EcoKnowGames) project is an interdisciplinary research programme that uses games to evaluate sustainable development solutions and support decision-making in complex social-ecological systems. How people collectively respond to environmental change will shape whether many of the global challenges of the 21st century are addressed, including those identified in the United Nations Sustainable Development Goals (SDGs). For instance, the SDGs relating to biodiversity, food and water security, and climate change. However, exploring and implementing solutions to these challenges is often constrained by the risks, costs and long timescales involved. EcoKnowGames addresses this challenge by developing virtual game worlds in which potential solutions can be explored and evaluated.

EcoKnowGames is funded by the UK Research and Innovation (UKRI) Cross-Research Council Responsive Mode Pilot Scheme (MR/Z505833/1). The core team includes members from the University of Stirling, the James Hutton Institute and King's College London, with Marist College as project partner. Game development is carried out with the games studio Glitchers.

The EcoKnowGames project is organised around five interconnected work packages spanning social-ecological modelling, decision-making and model integration, knowledge game design, policy impact and engagement, and the development of open-source game-building tools. This request arises from Work Package 4 (WP4), which examines how outputs from knowledge games can be translated into policy and practice.

While games have demonstrated value in supporting learning, stakeholder engagement and the exploration of policy options, the pathways through which game-generated knowledge can influence policy remain less well understood. In particular, the translation of game outputs into policy action may be challenging when addressing complex or "wicked" problems, where both problem definitions and potential solutions are contested.

To address this challenge, WP4 submitted a request through the Eklipse mechanism, leading to the establishment of an independent Expert Working Group (EWG) for knowledge synthesis and societal engagement. The EWG was asked to explore:

"What types of games and game features can enable games to become effective tools for connecting science and policy and strengthening the science-policy interface, while balancing scientific integrity with engaging gameplay? What are the key enablers and barriers affecting the use of games by policymakers for knowledge exchange, evidence synthesis and knowledge transfer?"

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Following discussions with the requesters, the EWG refined the scope of the request to focus on the policy process. Particular emphasis was placed on understanding the potential contribution of games to science-policy interfaces, the conditions under which game-based evidence may be considered credible and legitimate, and the opportunities and challenges associated with its use in policy contexts. These discussions informed the review objectives and research questions set out below

2. Objectives

The main goal of the request, put forward by the EcoKnowGames project team, is to improve understanding of how serious games can support biodiversity policymaking across the stages of the policy process, and to set out the conditions under which they can do so. A serious game is a game designed for a purpose beyond entertainment, in this request the exchange and use of knowledge in policy.

Specifically, the work aims to:

1. Map biodiversity policy and governance processes, identifying at each stage the task a policymaker is trying to accomplish, the challenges recorded in the literature, and where games could plausibly contribute.
2. Characterise games used at the science-policy interface by their purpose, application and the actors involved, and examine the evidence on their contributions, the balance between scientific integrity and play, and the conditions that make their outputs credible and usable for policymakers.
3. Consult experts and practitioners in biodiversity policy on where the policy process breaks down and which outcomes they treat as signs that policy is working, and identify the viewpoints they hold on the use of games and other forms of engagement in biodiversity policy.
4. Combine these results into a design framework that helps decide whether, where and under what conditions a game can serve a biodiversity policy task, and identify where evidence or guidance is still missing.

Groups 1, 2 and 3 of the EWG address aims 1, 2 and 3. Aim 4 combines their results through the integration step described in Section 3.2.

2.1 Policy relevance and geographical scope of the request

The results of this request can inform European Union (EU) legal instruments and international agreements, including the Convention on Biological Diversity, the SDGs, the Habitats and Birds Directives, the EU Nature Restoration Law and the Common Agricultural Policy. Understanding which games and game features can link science and

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policy may also connect the work to existing initiatives, such as the European Digital Twin of the Ocean, the Playing for the Planet Alliance and Games for Good. The geographical scope of the request is European: it covers European policy at EU, national, regional and local levels, within the international commitments that European policy implements.

2.2 Relevance for biodiversity

Games are a possible tool for biodiversity research, policy and management. Two features of biodiversity policy, raised in EWG discussions, shape how a game might serve it. First, non-human species and ecosystems have no direct seat in decision-making, so the representation of their interests depends on the people at the table. Second, biodiversity policy runs across levels, from global targets such as conserving 30 per cent of land and sea by 2030 under the Kunming-Montreal Global Biodiversity Framework, to national strategies and local decisions about a single species or habitat. The distance between the level where a decision is made and the place where it is implemented may affect which kind of game is useful.

3. Methods

3.1 Timeline and type of deliverables

The EWG is working toward a final report deadline of February 2027, with an extension to the end of March 2027, subject to funder approval. Data collection takes place in January 2027, once the protocol has passed external review.

The deliverable is a technical report presenting a design framework for deciding whether, where and under what conditions a game can serve a biodiversity policy task, supported by summaries of the results of the three working groups.

3.2 Methodological framework and integration

We propose a three-part methodological approach to inform the following interrelated research questions:

> **RQ1. What do policy (and more broadly, governance) processes look like in the domain of biodiversity, and where is there potential for games to contribute to positive outcomes?**
>
> **RQ2. What are games, and what are the potential benefits they may offer to policy and governance processes in order to have a nature-positive impact and protect biodiversity?**

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RQ3. What do experts and practitioners in the domain of biodiversity policy and governance cite as challenges or points of failure in the policy and governance processes they are familiar with? How do they see games as potentially addressing these issues?

As written, these questions ask first where in policy and governance processes there is scope for input or change from tools like games, for example, for learning, observation, or developing a shared understanding across different actors. The second question then puts games in focus and asks what specific benefits games may offer to policy. Questions 1 and 2 thus map the potential demand for, and supply of, games to support biodiversity policy outcomes. Question 3 then turns to practice. It compares the challenges and failures that practitioners report with the theory outlined in Question 1, and asks how practitioners see past or future game interventions helping to address them, set against the theory outlined in Question 2. As a set, the questions develop a clear theoretical scope for games in biodiversity policy, against which practice to date may be assessed.

What the combined results deliver: The three working groups together produce two things. The first is a set of conditions under which games can serve a biodiversity policy task, located at stages of the policy process. The second is a map of the viewpoints that policy experts hold on games and engagement, including viewpoints that resist their use. The conditions tell requesters where and how a game could help; the viewpoints prepare them for the reception a game will meet, and inform the question of legitimacy that the requesters raised.

Working in parallel: The groups run at the same time. Group 2 and Group 3 draw on early and partial outputs of the Group 1 review, and do not wait for its completion. Group 3 uses them to draft the statements for a Q-sort, an exercise in which each participant ranks a set of short statements from most disagree to most agree (Section 3.5.2). A sequential design would not fit the timeline (Section 6).

Table 1. Research questions, methods and links between groups.

Question	Group	Method	Main output	Passes to
RQ1	Group 1	Targeted literature review	Map of policy stages, dynamics and friction points by level of governance	Stage list used by Groups 2 and 3; friction points compared with Group 3 results; candidate statements for the Q-sort
RQ2	Group 2	Expert-led conceptual synthesis with	Typologies of game purposes, applications and actors; case assessments	Game purposes and conditions matched to policy stages;

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Question	Group	Method	Main output	Passes to
		illustrative cases		candidate statements for the Q-sort
RQ3	Group 3	Participatory workshops with proportional piling; online Q-sort	Weighted challenges and outcome visions by level; viewpoints on games and engagement in biodiversity policy	Challenges compared with Group 1; activities and games named added to Group 2 cases; viewpoints reported with the framework

3.3 Group 1: Review of biodiversity policy processes

3.3.1 Aim and sub-questions

Group 1 identifies the seminal and most-used bodies of knowledge on how biodiversity policy and governance processes work, and the friction points they describe. The review is targeted. It does not attempt a full systematic review.

Scope: peer-reviewed and grey literature (2011–2026) on biodiversity policy processes.

Sub-questions:

SQ1.1. How does the literature describe the biodiversity policy process, and which stages and actors does it include?

SQ1.2. Which policy process theories (for example, the multiple streams framework, the advocacy coalition framework and others) are applied to biodiversity policy, and what do they say about why proposals reach the agenda, advance to implementation, or stall?

SQ1.3. At which stages and governance levels does the literature identify friction points, and how does it characterise them?

SQ1.4. Which tools (games, models, scenarios) are proposed or used at these friction points, and at which stages and levels do they appear? Which friction points have no tools attached? This question links the work of Groups 1 and 2.

SQ1.2 responds to a limit of the policy cycle raised in the EWG. The cycle describes the steps a proposal passes through and leaves out the dynamics that decide whether it advances at all, such as windows of opportunity opening and coalitions forming around a problem. Theories of the policy process (Kingdon, 1984; Sabatier, 1988) supply this causal side. SQ1.1 and SQ1.2 establish what the process is, combining stages and actors with the mechanisms that drive or block progress. SQ1.3 shows where it breaks down, and SQ1.4 turns those friction points into candidate places for a game to act.

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3.3.2 Research strategy

A targeted search for peer-reviewed literature is run in Web of Science Core Collection (WoSCC) and Scopus. Searches query titles, abstracts and keywords (the "Topic" field in WoSCC and the TITLE-ABS-KEY field in Scopus), and terms are combined with Boolean operators. The draft search string is in Annexe 1. All retrieved references are exported, with abstracts and metadata, into an Excel master database, and duplicates are removed and logged before screening. Papers without open access are downloaded by members with institutional access and stored in the shared drive for use within the EWG only.

Each search combines one term from the core target set with one or more terms from the policy process set:

- **Core target terms (domain):** biodivers*, "biological diversity", conservation, "nature conservation", "nature conservation law", "ecosystem governance", "biodiversity governance".
- **Policy process terms:** "policy process*", "policy cycle", "policy formulation", "policy making", "policy practice", "policy dynamics", "policy decision making", "governance process", "policy bottleneck", "friction point", "policy window", "advocacy coalition".
- **Exclusion terms:** broad environmental and non-biodiversity sectors (for example climate change mitigation, carbon trade or offset, renewable energy); purely scientific or field studies (for example molecular biology, genomics, pollution); non-target fields that use "conservation" in another sense (for example energy conservation in physics, and historic, architectural or cultural heritage conservation).

Environmental and sustainability policies are left out of scope at first, since they may yield results too broad to screen, and can be brought in later. Any change to the search is logged.

3.3.3 Eligibility criteria

Once the search is complete, records are screened against the inclusion and exclusion criteria in Table 2.

Table 2. Eligibility criteria for Group 1.

Criterion	Inclusion	Exclusion
Language	English	All other languages

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Criterion	Inclusion	Exclusion
Document type	Peer-reviewed journal articles, book chapters, grey literature (formal policy reports, white papers, briefing notes)	Book reviews, editorial notes, conference abstracts without full text, purely ecological or biological field data with no governance link
Timeframe	2011–2026. Rationale: covers the Aichi Targets period through the adoption and early implementation of the Kunming-Montreal Global Biodiversity Framework (GBF)	Publications before 2011
Geographic scope	Europe. Rationale: policy dynamics, such as Horizon funding and regional or municipal policy entrepreneurship, align with the context of the requesting project	Non-European contexts
Policy alignment	Direct focus on, or explicit relevance to, the EU Biodiversity Strategy 2030, Natura 2000, the CBD, the Kunming-Montreal GBF, CITES and the Aichi Targets	General corporate sustainability frameworks; non-biodiversity environmental policy (for example circular economy, carbon accounting)
Quality, academic literature	Journals in core academic indexes	MDPI journals (rationale: the review targets seminal and most-used works, which appear mainly in established journals in the field, and the exclusion reduces the volume of records to screen; records excluded on this criterion are counted and reported); unindexed literature
Quality, grey literature	Official websites of government bodies or intergovernmental agencies	Blogs, press releases and other informal platforms

3.3.4 Screening

Study selection follows a two-phase screening process managed by the EWG. In phase 1, titles and abstracts are screened against the core inclusion criteria; records whose abstracts do not provide enough detail to reject or retain them with certainty are kept for phase 2. In phase 2, retained papers are read in full, with attention to the introduction, results and discussion, to extract the variables listed in Section 3.3.5.

Each record receives an include, exclude or uncertain code with the screener's initials. A second member independently screens a random 20 per cent sample at each phase, following guidance for reviews that use single-reviewer screening (Nussbaumer-Streit

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et al., 2023). Agreement on the sample is reported. Disagreements are discussed, and the resolution logged. When agreement is low, screeners revisit the criteria and double-screen a further sample before continuing single screening.

3.3.5 Data extraction

Data are extracted into a single shared Google Sheet, using fields based on the PerSPEcTiF framework (Booth et al., 2019), which structures extraction by perspective, setting, phenomenon of interest, environment, timeframe and findings:

1. **Perspective and context:** author(s), year, title, journal, publisher, DOI; publication type (peer-reviewed article, book chapter, or grey literature such as IUCN, UNEP or CBD reports and government white papers); period of data collection, where different from the publication year.
2. **Setting and structure:** geographical location (country, region, municipality of the case); policy target (biodiversity or conservation); level of governance (international or multilateral, supranational (EU), national, regional or state, municipal or local).
3. **Phenomenon of interest and theory:** policy cycle phase studied (agenda setting, formulation, decision-making or adoption, implementation, evaluation); policy process theory invoked (multiple streams framework, advocacy coalition framework, punctuated equilibrium, institutional analysis and development (IAD), or none and descriptive only); friction points identified, described in the paper's terms (for example stakeholder resistance, asymmetric information, veto players, budget deficits, conflicting departmental mandates); what the paper shows about how biodiversity or conservation policy processes, dynamics and decision-making work.
4. **Tools:** games, models or scenarios mentioned at the friction points, with the stage and level at which they appear (SQ1.4).

Uncertainties during extraction are resolved in weekly reconciliation sessions between the EWG and the Methods Expert Group, and the decisions are recorded.

3.3.6 Mapping and presentation

A scoping database is compiled with the metadata of all records retained after full-text screening. Where one document reports more than one case, for example, a national framework and a municipal case, each case receives its own entry ID (name_et_al_2026_1, name_et_al_2026_2). The results are synthesised into:

1. a co-occurrence network map of structural keywords and friction types;
2. a flow diagram linking governance levels, policy cycle phases, identified friction points, and existing tools or their absence.

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3.3.7 Output and limits

Group 1 produces the map of policy stages, dynamics and friction points used in the integration step, and contributes potential candidate statements to the Q-sort if these are considered appropriate (Section 3.5.6). The review is targeted, in English and limited to European contexts from 2011, so it shows the main published views within that scope and may miss work outside it.

3.4 Group 2: Games as evidence, an expert-led conceptual synthesis

3.4.1 Aim and sub-questions

Using a game in a policy process means examining more than its mechanics. Group 2 builds a structured, transparent account of the full setting in which a game is used: who designs it, who plays it, who facilitates it, who hears about it, and through which channels it reaches its audience. From this, the group develops a typology that classifies games by purpose and structure, organised around three connected dimensions: game types, game applications, and the people associated with the game (stakeholders, facilitators, and players). The typology explains how and why a game is used for different purposes.

Sub-questions:

- SQ2.1. Which purposes, applications and actors characterise games used at the science-policy interface in biodiversity and related fields?
- SQ2.2. What evidence exists on their contributions, at which stages of the policy process, and under which conditions?
- SQ2.3. On what grounds can a game be treated as a credible and legitimate source of evidence or deliberation in policy, and what do policymakers and scientists need to trust its outputs?

SQ2.3 responds to the requesters' interest in the legitimacy of games and why they would work.

3.4.2 Design and analytical framework

Group 2 conducts an expert-led conceptual synthesis in three linked parts: structured discussions among Working Group members (Section 3.4.3), assessment of six to ten illustrative game cases (Section 3.4.4), and development of three typologies (Section 3.4.5). The discussions guide which cases are selected and how the typologies are drawn, and the cases are used to test and refine the typologies.

Sources of evidence. Group 2 draws on existing evidence and expert judgement, and collects no primary data. It uses three kinds of sources and records, for each claim, which one it rests on:

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- **Documented findings**: published evaluations and studies of games, including early outputs of the Group 1 review on where biodiversity policy processes and games meet.
- **Practice experience**: project documentation and members' accounts of games they have designed, run or observed.
- **Expert interpretation:** positions reached in the structured discussions.

Keeping the three apart keeps conclusions proportionate to the evidence available. The synthesis follows principles of conceptual research, critical reflexivity and structured expert deliberation, and does not involve a systematic literature review or a comprehensive inventory of games.

- **Analytical framework**. The case assessments and the discussions use the same four dimensions (Table 3). Across them, the analysis looks for the mechanisms by which games may strengthen the science-policy interface: perspective-taking, negotiation, experimentation, feedback, collective learning and knowledge exchange

Table 3. Analytical framework for Group 2.

Dimension	What is recorded
D1. Purpose and policy context	The biodiversity issue addressed; the game's intended objectives and target audience; the stage of the policy cycle the game is meant to serve; how its outputs relate to policy questions, deliberation, decisions or implementation
D2. The game and scientific knowledge	Format, rules, roles, decision processes, incentives and feedback; how scientific evidence, uncertainty and other knowledge systems, including practitioners' knowledge, enter game design and play; the balance between scientific accuracy, accessibility and enjoyment
D3. People, facilitation and debriefing	Who commissions, designs, plays, facilitates and hears about the game, as the sources report; the materials used during facilitation, such as boards, maps or records the players produce; the questions asked during and after play, and whether they connect what players experienced to the learning sought and the policy question; preparation and follow-up that carry results into policy work
D4. Outcomes, evidence and conditions	Outcomes reported for engagement, learning, changes in perspective, interaction, decisions and policy; the type and quality of the evidence, separating what was observed during play from what was documented in real policy settings; limitations and unintended consequences; the conditions that supported or blocked credibility and uptake by policymakers

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D3 treats facilitation and debriefing as part of the intervention, assessed together with the game. The simulation and gaming literature places much of the learning in the debrief that follows play (Crookall, 2010), and a debrief that asks only about the activity, such as how enjoyable it was, leaves the link to the policy question unmade.

3.4.3 Structured discussions

The primary analytical process is a series of facilitated discussions among Working Group members, using the preliminary propositions from earlier meetings as the working basis. Two or three further rounds of 60 to 90 minutes each, preceded by members' individual written reflections, guide the selection and assessment of the cases (Section 3.4.4) and the development of the typologies (Section 3.4.5). A facilitator ensures balanced contributions and critical debate.

The discussions differ from a Delphi process, which uses anonymous rounds with controlled feedback to bring a panel to agreement (Linstone & Turoff, 1975). Here, members discuss openly with a facilitator, and disagreement is recorded as a result.

The discussions explore how game purposes, design features, facilitation approaches, and participant roles influence the use and interpretation of scientific evidence; how scientific integrity can be maintained while preserving engagement and enjoyment; which institutional, practical, and procedural conditions affect uptake by policymakers; and when games can improve the science-policy interface. Each session is documented in a summary of key arguments, supporting sources, revisions and unresolved disagreements. Consensus is not required where substantial differences remain.

3.4.4 Illustrative game cases

Drawing on members' expertise, existing publications and project documentation, about six to ten game cases are selected to show variation in objectives, designs, application contexts and policy relevance, including examples of mixed or limited success. Activities and games that Group 3 participants name in workshop Exercise 3 (Section 3.5.7) are added to the pool of candidate cases. Names that arrive after case selection closes are listed in the report as further examples and are not assessed.

Two kinds of claims. The cases support two different claims, which the report keeps apart. The first is that games can influence biodiversity policy: a single well-documented case is enough to show this. The second concerns the conditions under which they do so, which matters for the requesters' question of legitimacy and for the design framework. This claim needs comparison across cases, including cases of mixed or limited success. With six to ten cases, the report presents candidate conditions suggested by the contrasts between cases. Testing whether a game needs a given condition to succeed, or whether one condition is enough, would require many more cases.

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Each case is described and assessed on the four dimensions in Table 3, using a common template.

Each case is described by one member and checked by a second. A member who designed or delivered a game does not assess it. Cases are illustrative and are not used to estimate how common or how effective games are.

3.4.5 Conceptual typologies

Building on the Serious Games Cookbook (Whitby et al., 2024), three complementary typologies are developed and refined through discussion and comparison with the cases:

- **Game purposes**: what games seek to achieve, such as knowledge sharing, awareness raising, problem-solving, negotiation and the collaborative exploration of policy options, along with mutual learning, deliberation and evidence synthesis, for example, comparing evidence, exploring uncertainty, integrating different forms of knowledge and examining alternative assumptions or decisions.
- **Game applications**: how games are used, across physical, digital or hybrid formats, individual or collective play, facilitation, and integration into research, training, stakeholder engagement or policy processes.
- **Game-related actors and roles:** who commissions or designs games, contributes scientific expertise, designs and facilitates sessions, plays, observes outcomes, or becomes indirectly aware of a game and its messages; who interprets game outputs and uses them in policy; and how expertise, institutional responsibilities, interests and decision-making authority shape the interpretation and use of evidence.

Categories may overlap and are treated as provisional analytical distinctions, not as exhaustive or empirically validated classifications. A cross-cutting analysis across the three typologies examines enabling conditions and barriers, such as evidence credibility and relevance, alignment with policy needs, facilitation capacity, institutional support, and accessibility and inclusion. It also considers power relations and whose knowledge and perspectives are represented.

3.4.6 Output and limits

The findings are integrated with Group 1's map of biodiversity policy processes and Group 3's results to identify where different uses of games may be relevant, what conditions support them, and where evidence remains insufficient. Group 2 also contributes candidate statements to the Q-sort (Section 3.5.6), in particular on credibility and legitimacy.

- **Limit.** The cases depend on what members know and can access, so they may lean toward games from the group's own networks.

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- **Mitigation.** Cases are drawn from publications and project documentation as well as from members' experience; the selection includes cases of mixed or limited success; each case is checked by a second member; and members do not assess games they designed or delivered. The cases show possibilities and do not represent the field.

3.5 Group 3: Expert consultation through workshops and a Q-sort

3.5.1 Aim and questions

The consultation collects the judgment of people who work in biodiversity policy, which the review of Group 1 and the expert synthesis of Group 2 cannot supply. It addresses three sub-questions:

- **SQ3.1.** Where does the biodiversity policy process break down, and how strongly does each stage contribute to the problem?
- **SQ3.2**. Which outcomes do experts treat as a sign that biodiversity policy is working, and where do their views conflict?
- **SQ3.3**. Which viewpoints do experts hold on games and other forms of engagement in biodiversity policy, including where such engagement could change the course of a decision, and which of these viewpoints do they share or contest?

SQ3.1 and SQ3.2 are answered in the workshops. SQ3.3 is answered mainly by the Q-sort, with a short workshop discussion of the activities participants already use. SQ3.1 is compared with the map produced by Group 1. Activities and games named by participants are passed to Group 2.

3.5.2 Design

The consultation has two linked parts. The first is a set of online focus-group workshops with a structured scoring component. Proportional piling is the scoring method: each participant distributes a fixed number of points across a set of options to show relative weight. It comes from participatory epidemiology, where groups with expert knowledge rank priorities (Catley, 2005). The second part is a Q-sort, completed individually online before the workshop. Each participant ranks a fixed set of short statements on a grid from "most disagree" to "most agree". Analysis then groups participants whose rankings resemble each other, and each group is read as a shared viewpoint (Brown, 1980; Watts & Stenner, 2012). The method shows which ways of thinking about an issue exist and what each one holds. It does not show how many people hold each viewpoint, or whether a viewpoint is correct. The statement set, sorting procedure and analysis are described in Section 3.5.6.

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The unit of analysis in the workshops is the focus group, a breakout room of four to six participants. Rooms are formed by level of policy work so that levels can be compared:

- **Local and regional**: municipal, provincial, protected-area and community actors.
- **National:** ministries, agencies, national biodiversity strategy teams.
- **International:** convention secretariats, negotiators, multilateral bodies.

Where registrations at one level are too few to fill a room, a mixed-level room is formed, and each participant's level is recorded, so level can still be analysed at the participant level. Sessions run in English. A room in another language offered by EWG facilitators (currently French and Spanish) opens when at least four registrants prefer it, and a facilitator and note-taker who speak it are available. It runs as a mixed-level room, with each participant's level recorded. Transcripts are coded by a coder who reads the language, and quotations are translated for the report. Game and participation specialists are excluded from the participant pool, since Group 2 and the Working Group already hold that perspective.

3.5.3 Sample size and recruitment

Table 4. Sample size for Group 3.

	Workshop focus groups	Q-sort participants	Composition
Minimum	3 groups, 12 to 18 participants	15	One focus group per level; Q-sort participants from all three levels
Target	5 to 6 groups, 24 to 36 participants	25 to 35	Two focus groups per level

Guest, Namey and McKenna (2017) analysed 40 focus groups and found that over 80 per cent of themes appeared in two to three groups and 90 per cent in three to six, with three groups enough to identify all the most prevalent themes. The study sampled one population. We apply the figures per level and treat three groups as the floor for the whole study, limiting level comparisons accordingly (Section 3.5.11). Groups are added until a further group produces no new themes, and the study never stops below three groups.

For the Q-sort, the aim is the range of viewpoints, not their frequency, so the number of participants is kept below the number of statements, as Q methodology recommends (Watts & Stenner, 2012). Everyone invited to a workshop is also invited to complete the Q-sort, including those who cannot attend a session.

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Recruitment. Invitations go through Working Group and Eklipse networks, which can reach 100 to 200 potential participants, and are extended by snowball sampling, where initial contacts suggest further participants. The Eklipse team sends invitations using text agreed by the EWG. We seek a spread of geography, gender, age and career stage, and record these at registration. To offset non-attendance, each room is filled to eight registrations, targeting four to six attendees.

3.5.4 Workshop delivery

Workshops run online on Zoom, hosted by the Eklipse team, and last 90 minutes each, with up to three breakout rooms running in parallel. The minimum sample can be collected in one workshop of three rooms. The target is spread across two or three workshops at different times of day to accommodate time zones. Sessions are in English, with rooms in other languages under the conditions in Section 3.5.2.

A pilot session with four to six Working Group members precedes the first workshop to test timing, the scoring form and the recording set-up. If the pilot runs over time, Exercise 1d is dropped, and the shift analysis in Section 3.5.9 is not reported. Pilot data are not analysed.

Table 5. Staffing per workshop.

Role	Number	Task
Lead facilitator (EWG)	1	Runs the plenary and keeps time
Room facilitator (EWG)	1 per room	Runs the exercises and asks the prompts
Room note-taker (EWG)	1 per room	Notes, timestamps and local recording
Technical host (Eklipse)	1	Room assignment, form links and troubleshooting

A three-room workshop needs seven EWG members and one Eklipse technical host. A workshop runs only when every role is confirmed 48 hours ahead.

3.5.5 Materials and tools

Policy stage diagram. One diagram anchors the workshop exercises and serves as the shared reference for the three groups. It shows the stages of the science-policy interface diagram:

1. Framing of issues and problems
2. Identifying solutions

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3. Assessing policy options
4. Formal proposal
5. Decision and negotiation
6. Transposition and implementation
7. Monitoring, inspection and evaluation

An eighth option, outside the cycle, covers political dynamics, public attention and coalition-building. It answers the point raised in the Working Group that the cycle describes procedure and leaves out why some proposals advance and others stall. The final list is fixed at the pilot. The diagram is sent with the information sheet at least 48 hours before the session.

Scoring form. Scores are entered privately in an online form with a constant-sum question, which refuses submission until the points reach the required total. Wooclap, LimeSurvey, and Qualtrics are candidates; the tool is chosen at the pilot based on two conditions: it enforces the total and meets data-protection requirements. Each participant enters only their room and participant code (for example, W1-R2-P04). The form also asks for one written sentence explaining the highest-weighted stage. A practice link to the form is sent with the information sheet, and the lead facilitator shows the form on screen during the welcome.

Shared whiteboard and revised allocation. After everyone submits, the room facilitator displays the room's combined scores on a shared whiteboard to open discussion. At the end of the discussion, participants may revise their allocation through a second form, so any shift after discussion is recorded.

Video platform. Zoom, provided by Eklipse, supports breakout rooms and recording. Cloud recording captures only the main room, so each note-taker records their breakout locally with the host's permission. Participants are told in the information sheet which platform is used and may keep their camera off. The set-up is confirmed at the pilot.

3.5.6 Q-sort

Statement set. A pool of 80 to 120 candidate statements is drafted from four sources: the seminal works and early extraction of Group 1, the case and typology drafts of Group 2, the requesters' documents, and the records of EWG discussions. The pool covers five themes: friction points in the policy process; what working biodiversity policy looks like; the roles games and other engagement could play; credibility and legitimacy; and conditions for use, including facilitation and debriefing. The pool is reduced to 40 statements, balanced across the themes and between favourable and critical positions. Each statement holds one idea, in plain language that a policy actor with no experience of games can judge. The statement set is drafted in parallel with the reviews and does not wait for their completion.

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Pilot. Four to six people who will not take part, drawn from the Methods Expert Group and contacts outside the EWG, sort the draft set and comment on unclear, duplicated or loaded statements. The set is revised once and then fixed.

Sorting. Participants complete the sort online, individually, before their workshop, in 30 to 40 minutes. They first place each statement in one of three piles (agree, neutral, disagree), then arrange all 40 statements on a nine-column grid from −4 to +4, with 2, 3, 5, 6, 8, 6, 5, 3 and 2 places per column. Two short post-sort questions ask them to explain the statements placed at each end of the grid. Sorting before the workshop keeps the rankings independent of the group discussion. The tool is chosen at the pilot on the same two conditions as the scoring form, and each participant enters only their participant code. The Q-sort runs in English only, so that every participant ranks the same wording.

Analysis. Sorts are analysed by person, not by statement, in R with the qmethod package (Zabala, 2014). Factors are extracted by principal components, rotated by varimax, and retained when their eigenvalue exceeds 1 and at least two sorts load significantly on them. A loading is significant at $p < 0.01$ when it exceeds 2.58 divided by the square root of the number of statements (about 0.41 for 40 statements). For each factor, a composite sort is computed, and its distinguishing and consensus statements identified. Two researchers interpret each factor as a viewpoint, using the composite sort and the post-sort explanations, and agree on a short narrative for it.

3.5.7 Session run sheet

Table 6. Run sheet for one 90-minute workshop. Participants also spend 30 to 40 minutes on the Q-sort beforehand, and the invitation states the total time.

Minutes	Segment	Activity
0–5	Arrival	Technical checks; rooms pre-assigned
5–12	Plenary welcome	Purpose, verbal consent to record, Chatham House Rule; lead facilitator shows the scoring form on screen
12–17	Breakout rooms open	Introductions: name, role, level; each person opens the form link
17–30	Exercise 1a	Open discussion: where does the cycle let biodiversity down?
30–37	Exercise 1b	Private scoring: 100 points across eight options, plus one sentence

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Minutes	Segment	Activity
37–47	Exercise 1c	Scores displayed; each person explains their top stage
47–51	Exercise 1d	Optional revised allocation through the second form
51–55	Exercise 2a	Each person writes: *biodiversity policy would be working if ___*
55–70	Exercise 2b	Sentences read aloud; the facilitator picks two or three in tension for discussion
70–80	Exercise 3	Discussion: where could a different kind of engagement change a decision? Final prompt: *which activities or games do you use here?*
80–82	Return to plenary	
82–90	Plenary and close	Each room reports one point; next steps, member check explained, thanks

Each scoring step collects scores privately before anyone sees the group's results, so participants are not anchored by those who speak first. In Exercise 3, the facilitator asks about engagement and introduces games only in the final prompt, so participants name their own leverage points before hearing the topic the facilitators are known for.

3.5.8 Data collected

Table 7. Data collected.

Source	Step	Format	Responsible
Q-sort rankings (40 statements)	Before workshop	Tool export (.csv)	Q-sort lead
Q-sort post-sort explanations	Before workshop	Tool export	Q-sort lead
Point allocations (100 points, 8 options)	Exercise 1b	Form export (.csv)	Technical host
Revised point allocations	Exercise 1d	Form export (.csv)	Technical host

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Source	Step	Format	Responsible
Written justification of top stage	Exercise 1b	Form export	Technical host
End-state sentences	Exercise 2	Form or chat export	Note-taker
Activities and games named	Exercise 3	Notes	Note-taker
Audio of breakout discussion	Exercises 1–3	Local recording	Note-taker
Audio of plenary	All	Cloud recording	Technical host
Field notes with timestamps	All	Structured template	Note-taker
Participant attributes (level, region, gender, age band, years in role)	Registration	Form export	Eklipse Management Body

Transcription. The platform's automatic transcript is checked line by line against the audio within one week. Names, organisations and identifying details are replaced with codes during this check.

3.5.9 Quantitative analysis of the workshop scores

Point allocations are descriptive data. They show how weight is distributed within a group and are never treated as population estimates. Analysis is run in R, and the script is archived with the data.

- **Per stage, per group:** mean and median points, interquartile range, minimum and maximum, and the number of participants who placed any points on the stage.
- **Rankings:** each group's stages ranked by mean points, presented as a stage-by-group heat map and a ranked table.
- **Agreement within a group:** Kendall's coefficient of concordance (W), which measures how far participants in a room agree on the order of stages. Each participant's points are converted to ranks, with ties given average ranks. W ranges from 0, no agreement, to 1, complete agreement. It is reported with its chi-square approximation and, with four to six raters, read descriptively.
- **Agreement across groups:** W is computed again with each group's mean ranking as one rater, within and across levels.

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- **Shift after discussion:** for each participant and stage, the difference between the first and revised allocation, reported per group as the mean absolute shift and the stages that gained or lost most weight. Shifts describe change within the session and are not read as persuasion or learning.

No inferential tests compare levels: with three to six groups, and participants within a room influencing one another, the observations are not independent, and a significance test would claim more than the data can carry.

3.5.10 Qualitative analysis

Transcripts, written justifications, end-state sentences and Q-sort post-sort explanations are analysed with the framework method (Gale et al., 2013). The method combines a structure set in advance with codes that emerge from the data, and arranges results in a matrix of groups by themes, which suits the comparison across levels.

1. **Familiarisation:** both coders read all transcripts.
2. **Initial framework:** top-level categories follow SQ3.1 to SQ3.3: stages and the failures named at each, outcome visions, and leverage points with named activities. Codes inside each category emerge from the data.
3. **Double coding:** two coders independently code the first two transcripts, compare, and refine the codebook. Further transcripts are divided between the coders, with one in four coded by both as a check. Disagreements are resolved by discussion, and each resolution is logged.
4. **Charting:** coded material is summarised into the groups-by-themes matrix.
5. **Interpretation:** themes are compared within and across levels and set against the point allocations. Where a heavily weighted stage has thin discussion, or the reverse, this is reported as a finding in its own right.

Exercise 2. End-state sentences are coded into outcome categories, for example ecological condition, implementation, public engagement and equity. Category counts are given per group. Pairs of visions that cannot both be met are recorded as tensions.

Saturation. A running list of new codes per group is kept. When a group adds no new codes at the second level of the framework, saturation is declared for that level. Coding is done in a qualitative analysis package licensed by the host institution, in Taguette (free), or in a structured spreadsheet.

3.5.11 Credibility and limits

Credibility is checked in four ways:

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- **Triangulation**: point allocations compared with discussion, levels with each other, the workshop findings with the Group 1 map, and the Q-sort viewpoints with the workshop discussion.
- **Investigator agreement**: double coding, two researchers interpreting each Q-sort factor, and logged resolution of disagreements.
- **Member checking:** a two-page summary, including the Q-sort viewpoints, sent to participants with time to respond; corrections are recorded and incorporated.
- **Audit trail:** codebook versions, the Q-sort statement set and its revisions, analytic decisions and the R scripts are archived.

Reflexivity. The facilitators are game researchers and could steer discussion toward games. The exercise order (Section 3.5.7), the balance of favourable and critical statements in the Q-sort, and a short reflexive note written by each facilitator after every session address this, and the notes are read during interpretation.

Limits. With a minimum of three groups, each level rests on a single group, so differences between levels are reported as observed in this sample and are not claimed as stable features of those levels. All quantitative results describe weight within the workshops and are reported as within-group summaries, never as population percentages. The Q-sort viewpoints describe ways of thinking present among the participants; their number and content depend on the statement set, and they say nothing about how widely each is held or whether it is correct. Online delivery may under-represent participants with poor connectivity, and this is noted alongside the participant attributes.

Consent, data protection and the other ethical procedures are set out in Section 5.

3.6 Resources and support requested

Eklipse provides Zoom hosting and technical facilitation for the workshops, so no external facilitation support is requested. The remaining support needs are listed in Table 8, with estimated hours so that contracts can be arranged in time.

Table 8. Support requested from Eklipse. Hours are estimates.

Support	Group	Tasks	Hours (est.)	Period
Eklipse technical host	3	Zoom set-up, breakout rooms, form links, cloud recording	3 per worksh op	Dec–Jan

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Support	Group	Tasks	Hours (est.)	Period
Research assistant	1	Database export and deduplication, screening support, upkeep of the extraction sheet and the shared tracker, set-up of a shared reference library	60	Dec–Feb
Research assistant	3	Information sheet and consent form with the Methods Expert Group; transcript checking and pseudonymisation; support as second coder; descriptive analysis in R	70 to 90	Dec–Feb
Research assistant	3	Q-sort: online tool set-up, statement formatting, participant follow-up, data export	15 to 20	Dec–Jan

4. Limitations

Limits specific to each method appear in Sections 3.3.7, 3.4.6 and 3.5.11. The following limits apply across the protocol:

- **Coverage.** The Group 1 review is targeted, and the Group 2 cases are illustrative. The design framework identifies plausible roles for games and the conditions they need; it does not estimate how often games succeed or how effective they are.
- **Positionality.** Many EWG members design or study games, which may lean interpretation toward roles for games. The exercise order, the balanced Q-sort statement set, the reflexive notes that EWG facilitators write after each Group 3 session, the rule that members do not assess their own games in Group 2, and the visible record of disagreement in the integration matrix are the safeguards.
- **Language and geography.** The request covers European policy, and the Group 1 review covers English-language literature on European contexts. Group 3 also recruits actors working at international level, where European policy meets its international commitments. Most workshops run in English, the Q-sort runs only in English, and EWG and Eklipse networks are concentrated in Europe. Experiences from outside Europe and outside English may be under-represented in the evidence.
- **Perceptions and evidence.** The Q-sort records how experts think about games and policy, not whether games work. The report keeps viewpoints and evidence apart.
- **Comparison across levels.** At the minimum sample, each level of governance rests on one focus group, so differences between levels are reported as observed, not as stable features.

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- **Time and capacity.** The work relies on volunteer time and a January 2027 data collection window. The protocol sets a minimum that can be delivered: one workshop with three focus groups and 15 Q-sorts, so the consultation can still run if the timeline tightens.
- **Definition of a better outcome.** The EWG asked the requesters what end state they want biodiversity policy to reach. Group 3 Exercise 2 gathers experts' views on this, and the framework does not assume a single definition of a better outcome.

5. Ethical considerations

The Eklipse process is built on an ethical infrastructure of twelve measures to mitigate potential ethical risks (https://eklipse.eu/ethical-framework/). Besides protecting integrity and credibility, this framework supports cooperation between actors from different spheres of the science-policy-society interface. It applies to all EWG activities: participants in planned activities comply with the Eklipse Code of Ethics, and tailored ethical measures are established before activities begin. Eklipse is responsible for the administration of the framework and its procedures. Members of the Eklipse Management Body, the Knowledge Coordination Body and the Methods Expert Group work together to ensure good practice, and the ethical procedures for this request are approved through the peer review process. Eklipse prepares the ethical approval in parallel with the external review of this protocol.

Groups 1 and 2 involve no human participants: Group 1 works with published sources, and Group 2 is a deliberation among EWG members, who are authors of this protocol. The considerations below concern the work of Group 3, which focused on workshops and Q-sort:

1. Participant population and number required: Experts and practitioners who currently or recently work in developing, negotiating, implementing or evaluating biodiversity policy at the local and regional, national or international level. The workshops need a minimum of 12 to 18 participants in three focus groups and target 24 to 36 in five to six; the Q-sort needs a minimum of 15 and targets 25 to 35 (Section 3.5.3). Inclusion: adults able to take part in English, or in another language offered in a workshop room (Section 3.5.2); the Q-sort is in English. Exclusion: game and participation specialists, EWG members and members of the requesting project team.

2. Recruitment: Participants are recruited through Eklipse and EWG networks, extended by snowball sampling. The Eklipse team sends invitations using text agreed by the EWG. A registration form records level, region, gender, age band and years in role (Section 3.5.3).

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3. **Where the research takes place:** Online. The Q-sort is completed individually in an online sorting tool, and the workshops are hosted on Zoom by Eklipse, with scoring through an online form and a shared whiteboard (Sections 3.5.5 and 3.5.6).

4. **Incentives:** Participants are not paid for their time, which avoids financial motives for taking part. They are offered the option to be named in the final report as contributors.

5. **How consent is obtained**: An information sheet and an online consent form, covering both the Q-sort and the workshop, are sent with the registration link, at least 48 hours before the session. Consent to recording is confirmed verbally at the start of the session, and participants may keep their camera off.

6. **How consent is recorded:** The online consent form is stored with the registration record. The verbal confirmation is captured in the recording and noted in the session log.

7. **Ethical issues and mitigation:** Differences in seniority and institutional power between participants could silence some voices; rooms are formed by level, scores and Q-sorts are completed privately before discussion, and facilitators give quieter participants room to speak. Facilitators could steer discussion toward games; the exercise order, the balanced statement set and the reflexive notes written by the facilitators address this. Statements about named institutions may be sensitive; organisations are pseudonymised at transcription. Contributions from Indigenous or local community participants are recorded in their own terms and are not reframed into policy vocabulary during analysis. Participants complete a conflict-of-interest declaration at registration. Consent forms and conflict-of-interest declarations are developed by the EWG and the Methods Expert Group with the research assistant.

8. **Dissemination and feedback to participants:** Participants receive a two-page summary for member checking and a link to the final report, published through Eklipse. Those who agree are named as contributors.

9. **Anonymity and confidentiality:** Data are pseudonymised with participant codes at collection and transcription, and names, organisations and identifying details are removed. Quotations in the report are unattributed, and roles are described only at a level that does not identify the speaker. Sessions run under the Chatham House Rule.

10. **Access to identifiable information:** Registration data, audio, and the key linking codes to names are accessible only to two named EWG members, the Eklipse secretariat for registration, and the research assistant under a confidentiality agreement. Identifiable data are not used for any other purpose.

11. **Limits to privacy and confidentiality:** In a group setting, other participants hear each contribution. Participants are asked to respect the Chatham House Rule, but the EWG cannot enforce it, and the consent form says so. Contributions to a group discussion

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cannot be removed once transcripts are anonymised, and the consent form also states this.

12. Analysis, storage and retention: Analysis is described in Sections 3.5.6, 3.5.9 and 3.5.10. Data are held in institutional storage confirmed by Eklipse and handled under the General Data Protection Regulation (GDPR); working files are shared only with EWG and Methods Expert Group members involved in the analysis. Audio is deleted once transcripts are verified. Anonymised transcripts, scores and Q-sorts are kept until the report is published, then deleted or archived as the consent form specifies.

13. Conflict of interest: EWG members declare interests in games or organisations discussed. Members who designed or delivered a game do not assess it in Group 2. Participants complete a conflict-of-interest declaration at registration.

14. Participant information sheet and consent form: The research assistant drafts both documents with the Methods Expert Group and the EWG. They will be attached as Annex 3.

6. Timeline

Table 9 sets out the main tasks and milestones. The groups work in parallel.

Task	Description	Date
Task 1	Methods protocol: final group check	20 November 2026
	Protocol sent for external review (PDF link and comment form, shared through Eklipse channels)	23 November 2026
	External review closes (two to three weeks; at least six replies)	mid-December 2026
Milestone 1	Replies to review comments; final protocol	late December 2026
	Ethical approval, prepared by Eklipse in parallel	November–December 2026
Task 2	Group 1: search, export, screening and extraction	November 2026–January 2027
Task 3	Group 2: discussion rounds and case assessments	November 2026–January 2027
Task 4	Group 3: Q-sort statement pool drafted from Groups 1 and 2 and EWG records	November–early December 2026
	Group 3: Q-sort pilot; statement set fixed	mid-December 2026
	Group 3: workshop pilot; invitations sent	mid-December 2026
	Group 3: Q-sorts completed and workshops held	January 2027
	Group 3: transcription and analysis	late January–early February 2027
	Group 3: member check	February 2027

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Task	Description	Date
Milestone 2	Results of the three groups available for integration	February 2027
Task 5	Integration matrix, viewpoints and design framework	February 2027
Milestone 3	Draft report ready for peer review	February 2027
Milestone 4	Report finished	February to March 2027

7. Acknowledgements

To be added after the review process

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ANNEX 1: DRAFT SEARCH STRING FOR GROUP 1

Draft Scopus string built from the Group 1 term lists (Section 3.3.2), to be tested and refined by Group 1. The WoSCC version uses the TS= field and the same terms.

TITLE-ABS-KEY ((biodivers* OR “biological diversity” OR conservation OR “nature conservation” OR “nature conservation law” OR “ecosystem governance” OR “biodiversity governance”) AND (“policy process*” OR “policy cycle” OR “policy formulation” OR “policy making” OR policymaking OR “policy practice” OR “policy dynamic*” OR “policy decision making” OR “governance process*” OR “policy bottleneck*” OR “friction point*” OR “policy window*” OR “advocacy coalition*”)) AND NOT TITLE-ABS-KEY (“climate change mitigation” OR “carbon offset*” OR “carbon trad*” OR “renewable energy” OR genomic* OR “energy conservation” OR “cultural heritage” OR “architectural conservation” OR “historic conservation”) AND PUBYEAR > 2010 AND PUBYEAR < 2027

The exclusion block can remove relevant papers that mention an excluded term in passing. The string is run once with and once without it; the two counts are recorded, and a sample of the records removed by the exclusion block is checked before it is kept.

ANNEX 2: INSTITUTIONS IDENTIFIED AS HOLDING RELEVANT EXPERTISE

Institutions and initiatives (to be expanded)
European Commission Joint Research Centre (JRC) – Policy Lab
Serious Games Society (SGS)
Science Europe
European Citizen Science Association (ECSA)
United Nations Educational, Scientific and Cultural Organization (UNESCO)
Future Earth
Science at Home
EUSEA (European Science Engagement Association)

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ANNEX 3: PARTICIPANT INFORMATION SHEET AND CONSENT FORM

To be added after the review process

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