Table 1. The research process stages, examples of potential research waste and how ecology and conservation can limit these.

|  |  |  |
| --- | --- | --- |
| **Research Stage** | **Examples of potential for research waste** | **Where ecology and conservation can reduce waste** |
| Questions relevant to stakeholders | Irrelevant questions asked  Previous knowledge not properly taken into account | Co-development of research questions with stakeholders  Make use of evidence synthesis methods (e.g. cumulative meta-analysis, systematic mapping, systematic reviews, meta-analysis) to identify questions that are not satisfactory answered |
| Appropriate design and methods | Study poorly designed, under-powered (or over-powered. etc.)    Using inappropriate statistical tools (including overfitting etc.)    Previous knowledge not taken into account    Questionable research practices3 lead to poor quality research | Use simulations or power-analysis prior to undertaking data collection. Predefine effect size of interest with stakeholders (i.e do not rely on rules of thumb for “statistical significance”)  Better training of early-career researchers in methods. Open code and data to ensure reproducibility of methods  Make use of evidence synthesis methods (e.g. cumulative meta-analysis, systematic mapping, systematic reviews, meta-analysis) to identify questions that are not satisfactory answered  Open science (open methods and data, reproducible methods, sharing code, etc.)  Better training of early-career researchers in methods of open science and evidence synthesis. |
| Unbiased reporting | Lack of open data    Hypothesising after the results are known  *p*-hacking    File Drawer syndrome (only some studies are published) | Open science (open methods and data, reproducible methods, sharing code, etc.)  Pre-registration of hypotheses  Open science (open methods and data, reproducible methods, sharing code, etc.)  Pre-registration of hypotheses and methods. Open publishing (including preprints) |
| Accessible full publication | Publications not available to practitioners and decision makers | Open access publishing |
| Evidence synthesis | Research not designed or presented in the context of the existing knowledge | Using systematic reviews, systematic maps, meta-analysis, etc. to shape research priorities. Research gluts should be synthesised providing evidence to relevant stakeholders. Research gaps should be the focus of primary studies. |