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| **Research Stage** | **Examples of potential for research waste** | **Where ecology and conservation can reduce waste** |
| Questions relevant to stakeholders | Irrelevant questions asked | Co-development of research questions with stakeholders and using appropriate methodology such as Delphi exercises to avoid issues such as group think or not including the right group of experts or stakeholders |
| Previous knowledge not properly taken into account | Make use of evidence synthesis methods (e.g. cumulative meta-analysis, systematic mapping, systematic reviews, meta-analysis) to identify questions that are not satisfactorily answered |
| Appropriate design and methods | Study poorly designed, under-powered (or over-powered. etc.) | 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”) |
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| Using inappropriate statistical tools (including overfitting etc.) | Better training of early-career researchers in methods. Open code and data to ensure reproducibility of methods |
| Questionable research practices3 lead to poor quality research | 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 | Open science (open methods and data, reproducible methods, sharing code, etc.) |
| Hypothesising after the results are known | Pre-registration of hypotheses |
| *p*-hacking | Open science (open methods and data, reproducible methods, sharing code, etc.) |
| File-drawer syndrome (only some studies are published) | Pre-registration of hypotheses and methods. Open publishing (including preprints) |
| Incomplete reporting, making evidence synthesis difficult or impossible | Increasing knowledge of researchers and peer reviewers on what is essential to report, and changing journal guidelines where necessary to ensure all relevant information is reported |
| Accessible full publication | Publications not available to practitioners and decision makers | Open access publishing, including making resources available to researchers to be able to publish open access |
| 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. Where good quality evidence is available these should be synthesised providing evidence to relevant stakeholders. Research gaps should be the focus of primary studies. |