# Supplementary Information

Table S1. Composition of the EISs evaluated for each jurisdiction by types of developments considered.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Jurisdiction | Percentage of EISs (sample size in brackets) | | | | | | | | | |
| Agriculture | Energy | Fishing | Manufacturing | Marine Construction | Mining | Oil and Gas | Tourism | Transportation | Water Management |
| British Columbia | 0 | 30 (3) | 0 | 0 | 0 | 30 (3) | 40 (4) | 0 | 0 | 0 |
| California | 0 | 40 (4) | 0 | 0 | 20 (2) | 0 | 20 (2) | 10 (1) | 10 (1) | 0 |
| Veracruz | 0 | 20 (2) | 0 | 0 | 10 (1) | 0 | 30 (3) | 0 | 20 (2) | 20 (2) |
| Brazil | 0 | 40 (4) | 0 | 0 | 10 (1) | 20 (2) | 10 (1) | 0 | 20 (2) | 0 |
| England and Wales | 0 | 90 (9) | 0 | 0 | 0 | 0 | 0 | 0 | 10 (1) | 0 |
| Queensland | 9 (1) | 0 | 0 | 9 (1) | 0 | 55 (6) | 9 (1) | 0 | 18 (2) | 0 |
| New Zealand | 0 | 14 (1) | 14 (1) | 0 | 0 | 0 | 0 | 0 | 72 (5) | 0 |

Table S2. List of species selected and associated area measurements (in km2).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Regulatory Regime | species of concern | scientific name | range (km2) | Area Measurement | Resource |
| British Columbia | grizzly bear | *Ursus arctos* | 791044 | area of occupancy | BC Species and Ecosystem Explorer1 |
| British Columbia | mountain goat | *Oreamnos americanus* | 693000 | area of occupancy | BC Species and Ecosystem Explorer1 |
| British Columbia | silverhaired bat | *Lasionycteris noctivagans* | 683352 | extent of occurrence | BC Species and Ecosystem Explorer1 |
| British Columbia | western toad | *Anaxyrus boreas* | 755788 | area of occupancy | BC Species and Ecosystem Explorer1 |
| British Columbia | steelhead trout | *Oncorhynchus mykiss* | 399409 | extent of occurrence | BC Species and Ecosystem Explorer1 |
| British Columbia | northern caribou | *Rangifer tarandus caribou* | 180000 | extent of occurrence | BC Species and Ecosystem Explorer1 |
| California | Nelson's Antelope squirrel | *Ammospermophilus nelsoni* | 26800 | extent of occurrence | California Department of Fish and Wildlife2 |
| California | Rufous sided towhee | *Pipilo erythrophthalmus* | 4700 | extent of occurrence | California Department of Fish and Wildlife2 |
| California | western fence lizard | *Sceloporus occidentalis* | 89500 | extent of occurrence | California Department of Fish and Wildlife2 |
| California | western snowy plover | *Charadrius alexandrinus nivosus* | 58900 | extent of occurrence | California Department of Fish and Wildlife2 |
| California | belding's savannah sparrow | *Passerculus sandwichensis beldingi* | 1000 | extent of occurrence | California Department of Fish and Wildlife2 |
| California | california brown pelican | *Pelecanus occidentalis californicus* | 129200 | extent of occurrence | California Department of Fish and Wildlife2 |
| Veracruz | Swainson's hawk | *Buteo swainsoni* | 612300 | extent of occurrence | Conabio3 |
| Veracruz | scissor tailed flycatcher | *Tyrannus forficatus* | 424900 | extent of occurrence | Conabio3 |
| Veracruz | red lored amazon | *Amazona autumnalis* | 220600 | extent of occurrence | Conabio3 |
| Veracruz | northern crested caracara | *Caracara cheriway* | 1271800 | extent of occurrence | Conabio3 |
| Veracruz | Morelet's crocodile | *Crocodylus moreletii* | 396455 | area of occupancy | Conabio3 |
| Veracruz | reddish egret | *Egretta rufescens* | 315300 | extent of occurrence | Conabio3 |
| Brazil | Brazilian three banded armadillo | *Tolypeutes tricinctus* | 1066200 | extent of occurrence | ICMBIO4 |
| Brazil | pampas deer | *Ozotoceros bezoarticus* | 30000 | area of occupancy | ICMBIO4 |
| Brazil | maned three toed sloth | *Bradypus torquatus* | 133300 | extent of occurrence | ICMBIO4 |
| Brazil | southern brown howler monkey | *Alouatta guariba clamitans* | 858600 | extent of occurrence | ICMBIO4 |
| Brazil | Rufous gnateater | *Conopophaga lineata* | 6000 | extent of occurrence | ICMBIO4 |
| Brazil | Plain Xenops | *Xenops minutus* | 2000 | area of occupancy | ICMBIO4 |
| England and Wales | Greater horseshoe bat | *Rhinolophus ferrumequinum* | 50543 | extent of occurrence | Joint Nature Conservation Committee5 |
| England and Wales | water vole | *Arvicola amphibius* | 7780 | extent of occurrence | Joint Nature Conservation Committee5 |
| England and Wales | smoothe snake | *Coronella austriaca* | 4289 | extent of occurrence | Joint Nature Conservation Committee5 |
| England and Wales | sand lizard | *Lacerta agilis* | 8850 | extent of occurrence | Joint Nature Conservation Committee5 |
| England and Wales | Dormouse | *Muscardinus avellanarius* | 77731 | extent of occurrence | Joint Nature Conservation Committee5 |
| England and Wales | Bechstein's bat | *Myotis bechsteinii* | 31850 | extent of occurrence | Joint Nature Conservation Committee5 |
| Queensland | black throated finch | *Poephila cincta cincta* | 5000 | area of occupancy | Australian Government Department of Environment6 |
| Queensland | red goshawk | *Erythrotriorchis radiatus* | 200000 | area of occupancy | Australian Government Department of Environment6 |
| Queensland | regent honeyeater | *Anthochaera phrygia* | 600000 | extent of occurrence | Australian Government Department of Environment6 |
| Queensland | Squatter pigeon (southern distribution) | *Geophaps scripta* | 10000 | area of occupancy | Australian Government Department of Environment6 |
| Queensland | large eared pied bat | *Chalinolobus dwyer* | 9120 | area of occupancy | Australian Government Department of Environment6 |
| Queensland | border thick tailed gecko | *Uvidicolus sphyrurus* | 1000 | area of occupancy | Australian Government Department of Environment6 |
| New Zealand | New Zealand pigeon | *Hemiphaga novaeseelandiae* | 669000 | extent of occurrence | IUCN7 |
| New Zealand | grey warbler | *Gerygone igata* | 721000 | extent of occurrence | IUCN7 |
| New Zealand | paradise shelduck | *Tadorna variegata* | 670000 | extent of occurrence | IUCN7 |
| New Zealand | giant kokopu | *Galaxias argenteus* | 348 | area of occupancy | IUCN7 |
| New Zealand | wrybill | *Anarhynchus frontalis* | 23000 | extent of occurrence | IUCN7 |
| New Zealand | New Zealand bush falcon | *Falco novaeseelandiae* | 428000 | extent of occurrence | IUCN7 |

1 http://a100.gov.bc.ca/pub/eswp/

2 https://www.wildlife.ca.gov/

3 https://www.gob.mx/conabio

4 http://www.icmbio.gov.br

5 http://jncc.defra.gov.uk/

6 http://environment.gov.au/

7 http://www.iucnredlist.org/

Table S3. Studies on longevity of Acid Mine Drainage (AMD) impacts

|  |  |
| --- | --- |
| Type of Mine | Years after mine closure |
| Zinc-copper [14](#_ENREF_14) | 50 |
| gold and arsenic [37](#_ENREF_37) | 8 |
| lead and zinc [38](#_ENREF_38) | 45 |
| Coal [39](#_ENREF_39) | 62 |
| Coal [40](#_ENREF_40) | 50 |
| Coal [40](#_ENREF_40) | 65 |
| Coal [40](#_ENREF_40) | 65 |
| Coal [40](#_ENREF_40) | 60 |
| Coal [40](#_ENREF_40) | 55 |
| Coal [40](#_ENREF_40) | 55 |
| Coal [40](#_ENREF_40) | 53 |
| Coal [40](#_ENREF_40) | 55 |
| Coal [40](#_ENREF_40) | 55 |
| Coal [40](#_ENREF_40) | 65 |
| Coal [40](#_ENREF_40) | 55 |
| Coal [40](#_ENREF_40) | 52 |
| Coal [40](#_ENREF_40) | 70 |
| Coal [40](#_ENREF_40) | 70 |
| Coal [40](#_ENREF_40) | 55 |
| Coal [40](#_ENREF_40) | 58 |
| Coal [40](#_ENREF_40) | 65 |
| Coal [40](#_ENREF_40) | 70 |
| Coal [40](#_ENREF_40) | 53 |
| Coal [40](#_ENREF_40) | 57 |
| Coal [41](#_ENREF_41) | 40 |
| Coal [41](#_ENREF_41) | 65 |

Table S4. A typology of consultation with stakeholders used in our study.

|  |  |
| --- | --- |
| **Typology of Participation (adapted from Hughes 1998)** | **Example** |
| 1. Inform stakeholders | Consultant or extension worker appears in village and tells villagers that an irrigation scheme will be constructed to "improve" crop yield. |
| 2. Collect data from stakeholders | Consultant or extension worker appears in village and asks for information about their crops, and about seasonal water flows. Records their answers and leaves. |
| 3. Hear stakeholder views | Consultant or extension worker explains that crop yields need to be improved, and that the government intends to build an irrigation scheme. They seek the views and responses of villagers (for example, how they feel it might increase soil erosion), and then leave. |
| 4. Respond to stakeholder concerns | Consultants or extension workers inform villagers that they intend to construct an irrigation project. The consultants then facilitate the development of a village committee to discuss particular aspects of the project (such as minimizing soil erosion, downstream impacts on fisheries; or to agree on arrangement for water management). |
| 5. Stakeholders assess impacts | Local villagers identify their own needs, and external facilitators work with them to assist in finding solutions to potential negative impacts and improving positive effects. In some cases, new institutions will develop at the local level, which might then play a role in the management of their own project and its impacts. Villagers then have a real stake in maintaining structures or practices. |
| 6. Stakeholders self-mobilize | Villagers plan and identify their own irrigation structures, perhaps learning from experience in a nearby village. They may develop contacts with external institutions for resources and technical advice they need, but retain control over how resources are used. |

Table S5. Table of jurisdictions, relevant legislation, and links to legislation and guidance documents associated with each.

|  |  |  |
| --- | --- | --- |
| **Jurisdiction** | **Legislation** | **Links** |
| California | California Environmental Quality Act (state) – 1970 | [Legislation and Official Guidance Documents](http://ceres.ca.gov/ceqa/docs/CEQA_Handbook_2012_wo_covers.pdf) |
| [Public Registry](http://www.ceqanet.ca.gov/) |
| British Columbia | Environmental Assessment Act (provincial) – 1994 | [Legislation](http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_02043_01) |
| [Official Guidance Documents](http://www.eao.gov.bc.ca/guidance.html) |
| [Public Registry](http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_home.html) |
| Queensland | Environmental Protection Act (state) – 1994 | [Legislation](https://www.legislation.qld.gov.au/view/html/inforce/current/act-1994-062) |
| Sustainable Planning Act (state) – 2009 | [Official Guidance Documents](https://www.ehp.qld.gov.au/management/impact-assessment/environmental_impact_assessment_guidelines.html) |
| State Development and Public Works Organization Act (state) – 1971 | [Public Registry](https://www.ehp.qld.gov.au/management/impact-assessment/eis-processes/concluded.html) |
| New Zealand (RMA) | Resource Management Act – 1991 | [Legislation](http://www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html) |
| [Official Guidance Documents](http://www.mfe.govt.nz/publications/rma/aee-guide-aug06/html/index.html) |
| [Public Registry](http://www.epa.govt.nz/consultations/rm/Pages/default.aspx) |
| Brazil | Constituição da República Federativa do Brasil – 1988 | [Legislation](http://www.planalto.gov.br/ccivil_03/constituicao/constituicao.htm) |
| [Official Guidance Documents](http://www.ibama.gov.br/licenciamento/) |
| [Public Registry](http://licenciamento.ibama.gov.br/) |
| Mexico | General Law on Ecological Equilibrium and Environmental Protection 1988 | [Legislation](http://www.wipo.int/wipolex/en/text.jsp?file_id=182278) |
| [Official Guidance Documents](http://www.paot.org.mx/centro/ine-semarnat/gacetas/GE03.pdf) |
| England and Wales | Directive 2011/92/EU of the European Parliament and of the Council (union) – 2011  Town and County Planning (Environmental Impact Assessment) Regulations 2011 | [Legislation](http://www.legislation.gov.uk/uksi/2011/1824/contents/made) |
| [Official Guidance Documents](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/7676/155958.pdf) |

# Supplementary Literature Cited

37. D. P. Lawrence, *Environmental Impact Assessment Review* **27**, 755 (2007).

38. A. Canty, B. Ripley. (2015).

39. B. Tummers. (2006).

40. M. Abràmoff, P. Magalhães, S. Ram, *Biophotonics International* **11**, 36 (2004).

41. R. Hughes, *Environmental impact assessment and stakeholder involvement*. (IIED London, UK, 1998).

42. M. Khaska, C. L. G. La Salle, P. Verdoux, R. Boutin, *Journal of contaminant hydrology* **177**, 122 (2015).

43. C. Casiot *et al.*, *Appl. Geochem.* **24**, 787 (2009).

44. M. K. Lupton, C. Rojas, P. Drohan, M. A. Bruns, *Restoration Ecology* **21**, 320 (2013).

45. J. Skousen, L. McDonald, B. Mack, J. Demchak, *ICARD: Lexington, American Society for Mining and Reclamation*, 2044 (2006).

46. D. C. Lambert, D. A. Dzombak, W. W. Aljoe, in *Proc. of the 21st West Virginia Surface Mine Drainage Task Force Symp., Morgantown, WV*. (2000), pp. 4-5.