

1 **Avoiding impacts on biodiversity through strengthening the first stage of**
2 **the mitigation hierarchy**

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20
21 **Abstract**

22
23 The mitigation hierarchy is a decision-making framework designed to address
24 impacts on biodiversity and ecosystem services through first seeking to avoid
25 impacts wherever possible, then minimising or restoring impacts, and finally by
26 offsetting any unavoidable impacts. Avoiding impacts is seen by many as the
27 most certain and effective way of managing harm to biodiversity, and its position
28 as the first stage of the mitigation hierarchy indicates that it should be
29 prioritised ahead of other stages. However, despite an abundance of legislative
30 and voluntary requirements, there is often a failure to avoid impacts. We discuss
31 reasons for this failure and outline some possible solutions. We highlight the key
32 roles that can be played by conservation organisations in cultivating political
33 will, holding decision-makers accountable to the law, improving the processes of
34 impact assessment and avoidance, building capacity, and providing technical
35 knowledge. A renewed focus on impact avoidance as the foundation of the
36 mitigation hierarchy could help to limit the impacts on biodiversity of large-scale
37 developments in energy, infrastructure, agriculture and other sectors.

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44 **Introduction**

45

46 The development of mines, infrastructure, buildings and plantations changes
47 landscapes and seascapes profoundly, putting pressure on biodiversity and often
48 reducing the provision of important ecosystem services. The mitigation
49 hierarchy is a decision-making framework developed with the aim of preventing
50 and remediating environmental impacts from such developments. It requires
51 developers to first avoid impacts where possible. Where impact avoidance is not
52 possible, developers should strive to minimise impacts, to restore affected areas,
53 and finally, to offset any remaining residual impacts (McKenney & Kiesecker,
54 2010; Clare et al., 2011; BBOP, 2012a; Gardner et al., 2013).

55

56 The first part of the mitigation hierarchy – impact avoidance – requires
57 developers to “anticipate and prevent adverse impacts on biodiversity before
58 actions or decisions are taken that could lead to such impacts” (Ekstrom et al.,
59 2015). Impact avoidance is typically identified as the most important stage of the
60 mitigation hierarchy (McKenney & Kiesecker, 2010; Clare et al., 2011; Ekstrom et
61 al., 2015). In principle, impact avoidance can reduce the need for remediation,
62 thus side-stepping problems such as restoration time lags, limits to what can be
63 offset, and negative social implications of removing people’s access to nature
64 locally and attempting to replace it elsewhere (Bendor, 2009; Maron et al., 2010;
65 Pilgrim, Brownlie, Ekstrom, Gardner, von Hase, ten Kate, Savy, Stephens, Temple,
66 Treweek, Ussher, et al., 2013; Ives & Bekessy, 2015).

67

68 In practice, there are concerns that impact avoidance is often ignored,
69 misunderstood and poorly applied by developers, impact assessment
70 practitioners and regulators (Clare et al., 2011; Villarroya et al., 2014). At the
71 same time, there are signs of offsetting being situated in policy as a means to
72 legitimise development which would not otherwise have been permitted
73 (Walker et al., 2009; Ferreira et al., 2014; Sullivan & Hannis, 2015). Situating
74 offsets as a “license to trash” runs counter to the principle of avoiding negative
75 impacts to the maximum extent practicable, a core tenet of the mitigation
76 hierarchy (US EPA and DA, 1990; McKenzie & Kiesecker, 2010; BBOP, 2012a).

77

78 We review the incentives and requirements for impact avoidance, identify
79 challenges for achieving it, and outline some possible solutions, with an
80 emphasis on the ways in which conservation organisations can advocate for
81 better impact avoidance. The issues discussed here, and a wider range of case
82 studies, are detailed further by BirdLife International et al. (2015) and Ekstrom
83 et al. (2015).

84

85 **Current incentives, requirements and criteria for impact avoidance**

86

87 National laws, voluntary sustainability standards, corporate commitments and
88 pressure from civil society organisations all have roles to play in creating
89 incentives and requirements for impact avoidance. Most countries require
90 impact avoidance to be considered as part of the Environmental and Social
91 Impact Assessment (ESIA) process (Pope et al., 2013). Sustainability standards
92 include those set by financial institutions, such as Performance Standard 6 of the

93 International Finance Corporation, as well as sector-specific standards such as
94 those of the Roundtable on Sustainable Palm Oil (RSPO). Companies are
95 increasingly adopting commitments to No Net Loss (NNL) or Net Positive Impact
96 (NPI), which seek to ensure that negative impacts on biodiversity and ecosystem
97 services are balanced (for NNL) or outweighed (for NPI) by impact avoidance,
98 minimisation, restoration and offsetting (Gardner et al., 2013; Rainey et al.,
99 2015).

100

101 In Table 1, we summarise some of the key components (actions and criteria) of
102 standards and laws requiring avoidance, for a set of illustrative instruments.
103 Commonly-required actions include consultation, impact assessment,
104 consideration of cumulative impacts, and monitoring. Consulting with local
105 communities and conservation organisations is an important step in identifying
106 impacts that might be considered serious or unacceptable, and which might
107 otherwise go un-assessed. Conducting an ESIA is now standard practice in most
108 countries for large developments, but it is less common to consider the
109 cumulative impacts of multiple developments, including offsite, cryptic and
110 secondary impacts (Pope et al., 2013; Raiter et al., 2014). Transparent long-term
111 monitoring and evaluation is essential for demonstrating that commitments to
112 avoid and remediate impacts have been successfully upheld.

113

114 Our examples illustrate four recurrent criteria for moving past the avoidance
115 stage of the mitigation hierarchy. The first is that alternatives are given full
116 consideration by regulators and developers, both before and during the ESIA
117 (Table 1). These can include a “no-project” alternative, alternative site locations
118 (spatial impact avoidance), alternative scheduling of activities (temporal impact
119 avoidance), and use of technology and planning within a site (design-based
120 impact avoidance) (Table 2).

121

122 Early consideration of alternatives is advisable, alongside early engagement with
123 a full range of stakeholders to identify appropriate alternatives (Ekstrom et al.,
124 2015). The cost of altering a project is lower early in the planning process, before
125 decisions about locations and technologies are locked in and the range of feasible
126 alternatives is narrowed. Planning tools can facilitate access to data on existing
127 conservation designations and thus help to screen alternative sites, such as the
128 Integrated Biodiversity Assessment Tool (<http://www.ibatforbusiness.org>) and
129 national land-use planning and protected area databases.

130

131 A second common criterion for proceeding past the avoidance stage is that the
132 societal benefits of a project should outweigh its environmental costs. The
133 European Habitats Directive provides some of the clearest guidance here.
134 Impacts on priority habitats and species are only permitted for reasons of human
135 health, public safety, environmental benefit, or if there are “imperative reasons
136 of overriding public interest” for the project to proceed (Council of the European
137 Commission, 1992; European Commission, 2007). Even here, however, defining
138 when societal benefits are sufficient to justify environmental harm is subjective
139 and often highly political, a challenge explored further in the next section.

140

141 A third common criterion for moving past avoidance is delivery of NNL or a net
142 gain in biodiversity (BBOP, 2012a; Gardner et al., 2013). NNL is typically only
143 assessed for priority biodiversity features such as endangered species, Critical
144 Habitat and areas of High Conservation Value, even though it might be most
145 successfully applied to common species and ecosystems (Pilgrim, Brownlie,
146 Ekstrom, Gardner, von Hase, ten Kate, Savy, Stephens, Temple, Treweek, &
147 Ussher, 2013). There are partial exceptions: the UK National Planning Policy
148 Framework, for example, covers wider biodiversity in addition to designated
149 sites (Department for Communities and Local Government, 2012). However, the
150 Framework's reliance on the concept of "significant harm", means in practice
151 that small, cumulative impacts to common species are likely to be ignored. NNL
152 obligations can often be met through a promise of remediation as well as
153 through impact avoidance and minimisation (BBOP, 2012b).

154
155 Fourth, legal requirements can help to define opportunities for impact
156 avoidance, such as through identifying protected sites and species. Laws also set
157 requirements for planning and define how ESIA should be carried out, and where
158 they are contravened, they provide the basis for conservation organisations to
159 challenge failures to avoid impacts in the courts.

160 161 **Challenges for effective impact avoidance**

162
163 We surveyed the literature and drew on our experiences to identify challenges
164 for effective impact avoidance in five broad and often overlapping categories:
165 political will, regulation, process, capacity, and technical knowledge (Table 3).
166 Political will refers to the perceived importance among decision-makers of
167 avoiding impacts on biodiversity, relative to other concerns. In the absence of
168 political will, laws are less likely to be enforced, expensive alternatives are more
169 likely to be ruled "infeasible", and legal protection is at risk of being weakened or
170 corrupted to cater for powerful private interests. Mascia et al. (2014) found over
171 500 cases of downgrading, downsizing, or degazettement of protected areas in
172 57 countries, most commonly to facilitate industrial-scale resource extraction
173 and development. For companies in the public eye, reputational risk is an
174 incentive to develop the political will to ensure that impacts are reported and
175 avoided (Dawkins & Fraas, 2010), but for smaller companies, and those without
176 shareholders for whom environmental issues are important, it may not be.

177
178 The effectiveness of regulation depends both on the quality of legislation, and its
179 implementation in practice. In Indonesia, there is often a mismatch between
180 official maps and the physical reality of landcover, and thus it can be easier for
181 oil palm companies to obtain concessions in primary forest which is classified as
182 "nonforest estate" on official maps, rather than in the millions of hectares of
183 degraded land which – because it is mapped as "forest estate" – is legally
184 unavailable for development (Rosenbarger et al., 2013). This is a failure of the
185 legal system for land classification, arising perhaps from a lack of political will to
186 protect primary forests. A review of 11 European projects affecting sites
187 protected under the Habitats Directive found consistent failures by the European
188 Commission in the interpretation and application of the Directive (Kramer,
189 2009). In only three of these cases were alternative locations assessed, as

190 required by the Directive, and in few if any cases was a robust argument
191 established for the project being of “overriding public interest” (for further
192 details see Kramer, 2009). In these cases, although the law seems to provide
193 strong protection in principle, it appears to have been undermined by
194 interpretations that privileged economic development and marginalised
195 environmental protection. In the Democratic Republic of Congo, mining rights
196 have been granted within protected areas, even though such areas are legally
197 protected from extractive activities (Javelle & Veit, 2012). This results from
198 contradictory regulations, inconsistent and outdated government information, a
199 lack of cooperation between the two relevant ministries, and ultimately,
200 opposing interests.

201
202 Even while acting within the law, regulators and companies have choices about
203 how to pursue the process of identifying and acting on opportunities to avoid
204 impacts. For example, if impact avoidance is not considered until the ESIA,
205 opportunities to fundamentally rethink project alternatives may no longer be
206 available. There are incentives, for those who would benefit from a project, to
207 ensure that “no-project” alternatives are not considered, and to overlook indirect
208 and cumulative impacts. Because ESIA and standards are typically applied at a
209 project rather than landscape scale, they are not ideally suited to identifying
210 strategic opportunities for impact avoidance. Within standards, requirements
211 vary, and there is scope for criteria such as those for identifying High
212 Conservation Values to be interpreted differently by different assessors (Senior
213 et al., 2015). Responsibility for ensuring permanent protection of avoided areas
214 may be unclear: areas avoided during an early phase may be demanded in later
215 stages of a project, and areas avoided by one company may not be avoided by
216 others. For example, Sakhalin Energy’s avoidance plans (Table 2) were
217 undermined by Exxon’s plans to conduct seismic surveys in the same area
218 (Western Grey Whale Advisory Panel, 2015).

219
220 Government departments, companies and civil society organisations all too often
221 lack sufficient capacity and resources to properly understand, develop and
222 implement sound environmental policies (Quétier et al., 2014). National and
223 local governments often lack (or do not allocate) sufficient resources to audit
224 compliance with legislation. Small and medium-sized companies may be unable
225 to afford in-house expertise on biodiversity and the mitigation hierarchy.
226 Effective impact avoidance may require upfront investments in assessment and
227 planning at a time when there may be uncertainty about whether a project will
228 proceed. Even large companies may be unwilling to incur these costs. The
229 influence of civil society organisations may be limited if they are poorly-
230 resourced and have limited expertise, as is common with local groups.

231
232 Although knowledge is increasing, there are still many gaps in technical
233 understanding of the spatial distributions and population status of species,
234 especially for plants and invertebrates (Pimm et al., 2014). This makes it difficult
235 to identify and prioritise the sites of most importance in advance of
236 developments. Information on the success and costs of restoration and offsetting
237 efforts is also sparse. Unrealistic assumptions about the capacity and cost of
238 restoration and offsetting could result in promises of remediation being a more

239 attractive option for companies than avoiding impacts early in the project cycle.
240 A further challenge is that there may be trade-offs between impact avoidance
241 and other conservation strategies. For example, one way to avoid expanding into
242 natural habitats is to consolidate timber production, farming and infrastructure
243 in existing zones or corridors of disturbance. There is widespread evidence that
244 'sparing' land in this way would be beneficial for many wild species, even if it
245 increases the per-hectare impacts of development (Edwards et al., 2014;
246 Balmford et al., 2015; Stott et al., 2015). However, some degree of 'sharing' land
247 with multiple uses to reduce the per-hectare impacts of land uses is also
248 desirable, and clear guidance on how to balance these strategies is not available
249 in most places.

250

251 **Confrontation or compromise?**

252

253 Conservation organisations have strategic choices to make about when to
254 collaborate with developers, or oppose them. Campaigning against harmful
255 developments is important, and this strategy of 'saying no' can help to
256 counterbalance the ambit claims (extreme initial demands) of developers
257 (Laurance, 2016). Opposition is thus an important conservation strategy.

258

259 Conservation organisations can also play a role in identifying where
260 developments *should* take place. A key problem with focusing exclusively on
261 impact avoidance is the risk of leakage, or displacement of impacts. Development
262 avoided at one location is likely to take place elsewhere. Even project
263 cancellation is no guarantee that impacts have been avoided, unless regulation
264 also constrains the demand drivers incentivising development. Insofar as
265 development is driven by market demands for minerals, energy and other
266 resources, those demands will continue to incentivise further development
267 (Meyfroidt et al., 2013). Thus, it may be as important for conservationists to get
268 involved in defining where development is acceptable, as where it is not (Venter
269 et al., 2013; Dinerstein et al., 2015). Mapping priority areas for avoidance often
270 also by implication identifies locations for development which may be more
271 appropriate (Bright et al., 2008; Martin et al., 2015).

272

273 There are risks involved in both confrontational and collaborative strategies. As
274 conservation interests are typically less powerful than development interests,
275 opposition might leave conservation organisations marginalised and without
276 input into decisions. On the other hand, too much willingness to compromise
277 could result in 'greenwash', conferring an image of environmental responsibility
278 on companies in exchange for minimal concessions or donations (Robinson,
279 2012). The best strategy will be context-dependent, and in some situations a
280 combination of principled opposition and pragmatism might have most success.
281 For example, conservation organisations engaged with local and national
282 authorities to develop standards for new housing developments near the
283 Thames Basin Heaths in the UK. Disturbance-sensitive bird species were
284 protected by avoiding construction within a buffer zone, while developers were
285 required to provide dog-walking areas alongside new housing nearby to
286 minimise additional disturbance (BirdLife International, 2015).

287

288 **Opportunities for more effective impact avoidance**

289

290 There are multiple ways in which conservation organisations can work towards,
291 and support, more effective impact avoidance (Table 3). They can harness and
292 broadcast public support for conservation, thus creating political space for
293 decision-makers who want to support impact avoidance (Downie, 2015) and
294 increasing the reputational cost on those who ignore it (Ivanova, 2015). When
295 they can establish or promote particular ways of thinking about issues ('frames'),
296 they influence the extent to which ecological values are considered in policy
297 development (Sullivan & Hannis, 2015). Conservation organisations could also
298 play a greater role in challenging corrupt or undemocratic institutions that give
299 private or political interests excessive influence (Greenwald et al., 2012). The
300 success of high-profile campaigns in persuading companies to adopt
301 sustainability standards and zero-deforestation commitments shows how
302 corporate policies can be influenced (Newton et al., 2013; Gibbs et al., 2016).

303

304 Regulation can be improved, both in the letter of the law and – perhaps more
305 often – in its application. Conservation organisations can advocate for more
306 stringent requirements for impact avoidance and clearly-defined legal protection
307 for sites and species. They can also campaign against subsidies and other
308 perverse incentives for development in areas of biodiversity importance, such as
309 the proposal by Brazil to open up to 10% of its strictly-protected areas to mining
310 (Ferreira et al., 2014). Conservation organisations could also campaign to extend
311 stronger protection to common species and habitats, which are sometimes
312 overlooked in legislation (Gaston, 2010). Working informally with state agencies
313 and developers might be fruitful: Malcolm and Li (2015) suggest that informal
314 dialogue in advance of submitting project proposals may have helped to reduce
315 the number of proposals submitted in the United States that would put
316 endangered species in jeopardy.

317

318 There are opportunities for conservation organisations to hold governments and
319 companies accountable to the processes and plans they have signed up to. They
320 can track compliance with legislation and standards, especially in jurisdictions
321 where there is limited capacity for public authorities to do so. They can also push
322 for voluntary actions that make success more likely, such as inclusion of indirect
323 and other enigmatic impacts in ESIA and genuine consideration of "no-project"
324 options. Perhaps the most important demand that they can make is for decision-
325 makers to consider impact avoidance from the earliest stages of the planning
326 process (Ekstrom et al., 2015). Had this been done in the case of the Via Baltica,
327 referenced in Table 2, for example, the case might not have gone to the European
328 Court of Justice and considerable legal costs and delays could have been avoided.

329

330 Building the capacity of individuals and institutions plays a pivotal role in the
331 success of conservation efforts (Brooks et al., 2012). Conservation organisations
332 can support the development of biodiversity-inclusive landscape and regional-
333 level zoning plans, as well as better policy guidance material to support the
334 implementation and enforcement of legislation on impact avoidance. They can
335 contribute to developing voluntary or regulatory mechanisms to ensure avoided
336 areas receive long-term protection – such as developing new legal mechanisms

337 for permanently retiring grazing leases on public land (Leshy & McUsic, 2009).
338 They have also played an important role in the development of voluntary
339 standards, and will continue to do so. For example, Greenpeace played a key part
340 in developing a methodology for identifying areas with high carbon stocks that
341 should be avoided, in order to address a key gap in the RSPO standard for oil
342 palm (Dinerstein et al., 2015).

343
344 Conservation organisations can provide tools and technical data to make it easier
345 to conduct cumulative, strategic and environmental impact assessments.
346 Examples include the Biodiversity Risks and Opportunities Assessment tool, and
347 the Migratory Soaring Bird Sensitivity Map (BirdLife International, 2015).
348 Conservation organisations can work with other civil society organisations to
349 understand synergies and trade-offs between multiple objectives, and find
350 common ground in advocating for impact avoidance. This may require
351 understanding complex interactions such as those between conservation and
352 other human interests. It may also involve identifying places where
353 developments might be acceptable, as well as where they should be avoided. A
354 final, crucial role is in better evaluation and communication of the success (or
355 otherwise) of efforts to avoid impacts (Baylis et al., 2016).

356 357 **Conclusion**

358
359 We suggest that a renewed focus on the first stage of the mitigation hierarchy
360 could help to limit the biodiversity impacts of large-scale developments in
361 energy, infrastructure, agriculture and other sectors. Conservation organisations
362 play an important role in cultivating political will, holding decision-makers
363 accountable to the law, improving the processes of impact assessment and
364 avoidance, building capacity, and providing technical knowledge. Ensuring that
365 impact avoidance is considered as early as possible in the planning process, and
366 that it is placed even more firmly at the heart of the mitigation hierarchy in both
367 policy and practice should be key demands on their agenda.

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370
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559 **Table 1. Examples of voluntary standards and national legislation which**
 560 **set requirements for impact avoidance by defining actions and criteria.**
 561 **Parentheses indicate cases where a requirement is acknowledged but not**
 562 **clearly defined.**
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	Standard or law	Actions				Criteria for moving past avoidance stage			
		Consult with stakeholders	Assess environmental and social impacts	Consider cumulative impacts	Implement long-term monitoring	No viable lower-impact alternative	Overriding public interest	No net impact on critical biodiversity features	Compliance with the law
Standards and guidance	Business and Biodiversity Offsets Programme: Standard on Biodiversity Offsets (2012)	✓	✓	✓	✓			✓	✓
	Cross Sector Biodiversity Initiative: A cross-sector guide for implementing the Mitigation Hierarchy	✓	✓	✓	✓	✓		✓	✓
	European Bank for Reconstruction and Development: Performance Requirement 6	✓	✓	✓	✓	✓	✓	✓	✓
	International Finance Corporation: Performance Standard 6*	✓	✓		✓	✓		✓	✓
	World Bank: proposed Environmental and Social Standard 6	✓	✓	✓	✓	✓		✓	✓
Legislation	Australia: Environment Protection and Biodiversity Conservation Act, environmental offsets policy		✓		(✓)	✓		✓	✓
	British Columbia (Canada): Policy for Mitigating Impacts on Environmental Values	(✓)	✓	✓	(✓)	✓			✓
	European Union: Habitats Directive 92/43/EEC, EIA Directive	✓	✓			✓	✓	✓	✓
	United Kingdom: National Planning Policy Framework 2012	✓	✓	✓		✓	✓	✓	✓

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 565 *Requirements for consultation and impact assessment are established in IFC Performance Standard 1
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567 **Table 2. Different types of impact avoidance, with examples. Inclusion of**
 568 **projects is solely to illustrate the range of actions that can be taken to avoid**
 569 **impacts on biodiversity, and should not be interpreted as endorsement,**
 570 **nor as a suggestion that best practice was necessarily followed.**
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Type of impact avoidance	Where appropriate	Example	References
No-project	Irreplaceable features with no viable alternatives, and where offsets unlikely to succeed	Development permit refused for São Luiz do Tapajós dam in Brazil	(Vidal, 2016)
		Titanium mine in Cardamom Mountains of Cambodia cancelled	(Hance, 2011)
Spatial avoidance	Lower-impact alternative locations can be identified	Site for desalination plant in Namibia selected to avoid tern colony	(Aurecon & SLR, 2015)
		Via Baltica road re-routed to avoid Rospuda Valley and other protected sites in Poland	(Niedziałkowski et al., 2012)
Temporal avoidance	Time periods when activities will not affect vulnerable features can be identified	Construction and seismic surveys suspended during breeding season of Steller's Sea Eagles and seasonal presence of Gray Whales in Okhotsk Sea, Russia	(Sakhalin Energy, 2009)
		Logging activities in United States scheduled during dry periods to avoid erosion and sediment runoff	(Bilby et al., 1989)
Design-based avoidance	Technology and planning can be used to modify project components to avoid specific impacts	Tunneling equipment used to install pipeline underground below estuary in Ireland	(Shell, 2014)
		Logging operations to re-use old access roads instead of creating new ones in Central Africa	(Kleinschroth et al., 2016)

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Table 3. Reasons for the failure of plans and policies to avoid impacts on biodiversity and ecosystem services, and some possible solutions.

	Reason for failure	Possible solutions
Political will	Lack of political will to support impact avoidance	Harness and broadcast public support for conservation; expose conflicts of interest; reform institutions giving private interests undue influence
	Culture within planning authorities of not valuing biodiversity	Make biodiversity education mandatory for all staff of planning authorities
Regulation	Legal protection insufficient to ensure impact avoidance	Incorporate mitigation hierarchy principles into legislation; resist efforts to weaken legislation
	Ineffective judicial frameworks for holding decision makers to account	Make full use of those judicial frameworks which are effective; lobbying for stronger legislation
	Failure to avoid impacts to biodiversity that is not considered "important"	Set avoidance requirements for biodiversity of all kinds, including common species and habitats
	Weak requirements for restoration and offsetting make remediation more attractive than impact avoidance	Enforce detailed, stringent requirements for restoration and offsetting, including higher bond requirements and penalties for failure to remediate
Process	Impact avoidance not considered until ESIA	Make early stakeholder engagement the industry norm; assess biodiversity risks before ESIA
	Failure to anticipate and identify likely impacts	Audit impact assessments; require assessment of indirect and cumulative impacts
	"No-project" option not considered	Require assessment of "no-project" option
	Poor communication between ecologists, engineers, other technical consultants	Require direct cooperation between consultant teams as part of ESIA contract
	Failure to adhere to plans	Hold governments, companies accountable to plans
	Decision to proceed is made on basis that remediation will compensate for impacts	Separate the decision to proceed from any assessment of remediation possibilities
Capacity	Lack of resources and ecological expertise within planning bodies	Dedicate resources to create ecologist roles within planning bodies; improve planner-ecologist liaison
	Poor coordination between conservation and planning authorities	Provide resources to integrate conservation planning into local, regional and national land-use planning
	Lack of permanent protection for avoided areas	Develop voluntary or regulatory mechanisms to ensure avoided areas receive long-term protection
Technical knowledge	Biodiversity data inaccessible or difficult to use	Improve data availability through platforms that increase ease of use by non-specialists
	Important biodiversity not prioritised and identified before development	Comprehensive assessments of important biodiversity at local, regional and national levels
	Limited understanding of trade-offs	Incorporate trade-off analysis into ESIA
	Perception that impact avoidance is too costly	Neutral analysis of costs and benefits of impact avoidance, including non-monetary
	Discounting of future costs relative to costs today	Estimation and communication of future costs and limitations of restoration and offsetting
	Unrealistic assumptions about technical capacity to restore makes remediation more attractive than avoidance	Collate evidence on efficacy of restoration and offsetting; communicate limits of remediation; use offset multipliers commensurate with uncertainties

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