Biodiversity offsets between regulation and voluntary commitment:

Development of a typology of voluntary biodiversity offsets using an expert and internet based research approach

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Subject: biodiversity offsets – a tool to address unavoidable residual negative impacts from development

Impact = biodiversity loss

Offset = biodiversity gain

Increasing number and diversity of biodiversity offsets

Rio Tinto QMM Ilminite Mine, Madagascar (Source: QMM 2007)
Problem statement: Growing controversy about mandatory vs. voluntary biodiversity offsets

Legal compliance
Fines & sanctions
Driven by government

Corporate responsibility
Business case
Driven by business

What is the way forward?

Practical evidence no longer fits under the dichotomy of mandatory vs. voluntary offsets
Theoretical and methodological baseline

• **Exploration of theoretical concepts for voluntariness** (Voluntary Environmental Approaches, Corporate Responsibility etc.) → derivation of criteria and definition of key terms

• **An expert and internet based research approach**: qualitative, explorative, participant observational, (Cyber)Science 2.0 and research in Web 2.0

• **Integration of theory AND empirics**: approach of **Empirically Grounded Typification** *(Kluge 1999)*

Steps and tools of internet based research used in this study *(Source: author’s own)*
Conceptual framework of seven biodiversity offset types

1. **Regulatory offsets**: required by law and enforced.
2. **Conditional offsets**: required by financial institutions (e.g. International Finance Corporation).
3. **Enabled offsets**: fostered by governments and NGOs through pilot schemes, guidance etc.
4. **Sectoral offsets**: taking part in a voluntary self-commitment of a sector (e.g. mining).
5. **Corporate offsets**: driven by a voluntary self-commitment of a corporation.
6. **Local offsets**: single offsets, that are most likely developed at local level in a consensual process.
7. **Altruistic offsets**: truly voluntary offsets that are driven by the altruistic motivation to make a positive impact.

<table>
<thead>
<tr>
<th>Motivation and ultimate goal and initiators</th>
<th>Pressure (compliance)</th>
<th>Incentive (cost-benefit)</th>
<th>Altruism / responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government</td>
<td>Type 1 regulatory offsets</td>
<td>Type 3a enabled offsets (by government)</td>
<td></td>
</tr>
<tr>
<td>Financial institute</td>
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<td></td>
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<tr>
<td>Sector</td>
<td>Type 4 sectoral offsets</td>
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<td>Corporation</td>
<td>Type 5 corporate offsets</td>
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</tr>
<tr>
<td>Local community</td>
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<td>Type 6b local offsets (license to operate)</td>
<td></td>
</tr>
<tr>
<td>NGOs</td>
<td>Type 3b enabled offsets (new global norms)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without major influence</td>
<td>Type 7 altruistic offsets</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Source: author's own)
## Example #1: Type 5 corporate offsets – QMM Ilminite mine (Madagascar)

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</tr>
</tbody>
</table>

*Images: Rio Tinto QMM floating dredge and plant (Source: EJ Atlas 2016)*

*Restoration of littoral forest (Source: QMM 2007)
### Example #2: Type 6 local offsets – Thameslink railway (UK)

<table>
<thead>
<tr>
<th>Motivation and ultimate goal and initiators</th>
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<td></td>
<td></td>
<td>Type 7 altruistic offsets</td>
</tr>
</tbody>
</table>

**Thameslink rail enhancement (Source: Woodley and Baker 2014)**

**Ground-breaking ceremony for restoration at Streatham Common (Source: Woodley and Baker 2014)**
Discussion of the typology

Differences between the types:
- Magnitude, location and particularities of the types
- Scale of development impacts
- Sectors/developments addressed
- Governance of the implementation

Limitations of the typology:
- Temporal aspects of biodiversity offsets
- Demand and supply side for biodiversity offsets
- Other drivers, e.g. consumers

Trends: Which of the offset types are promising?
- Depending on context
- Not one type alone preferred → all types have certain strengths and restrictions

→ The developed typology is dynamic, i.e. a starting point, not a final product!
Discussion of the types: First indications of advantages and disadvantages

Example #1: Type 5 corporate offsets

- Good global coverage
- Strong, top-down enforcement
- Comparability accross locations
- Perfect fit into business operations

- Restriction to a few global players
- No common standards
- No external verification

Example #2: Type 6 local offsets

- High context sensitivity
- Suitable also for small scale projects
- Balancing of stakeholders and their interests

- Time consuming
- No common standards
- Case specific, not transferable
- More difficult to integrate into business operations
Application – What can the typology be used for? The example of the EU No Net Loss Initiative

“an initiative to ensure there is no net loss of ecosystems and their services (e.g. through compensation or offsetting) by 2015” (European Biodiversity Strategy until 2020)

2015 public consultation

→ Initiative postponed

(Source: author's own, after European Commission 2015)
### Application – Clarify roles and responsibilities of actors

<table>
<thead>
<tr>
<th>Actors types</th>
<th>Government</th>
<th>NGOs</th>
<th>1. regulatory offsets</th>
<th>2. conditional offsets</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. regulatory offsets</td>
<td></td>
<td>Regulator, enforcing authority</td>
<td>Cooperation and mediation at national/local level, Foster and reinforce context sensitive implementation</td>
<td></td>
</tr>
<tr>
<td>2. conditional offsets</td>
<td></td>
<td>Cooperation and mediation at national/local level, Foster and reinforce context sensitive implementation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. enabled offsets</td>
<td></td>
<td>Enabling pilot schemes or incentives, guidance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. sectoral offsets</td>
<td></td>
<td>Cooperation and mediation at national/local level, Foster and reinforce context sensitive implementation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. corporate offsets</td>
<td></td>
<td>Cooperation and mediation at national/local level, Foster and reinforce context sensitive implementation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. local offsets</td>
<td></td>
<td>Structuring governance processes (bottom up)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Altruistic offsets</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

| Cross-cutting issues |  | Provide baseline data, set strategic nature conservation goals, landscape planning |

**Cross-cutting issues**

- **Governments**
  - Regulator, enforcing authority
  - Cooperation and mediation at national/local level, Foster and reinforce context sensitive implementation
  - Enabling pilot schemes or incentives, guidance
  - Structuring governance processes (bottom up)
  - Provide baseline data, set strategic nature conservation goals, landscape planning
Challenges → Biodiversity offsets require:

Growing variety → Differentiation
- describe the variety of biodiversity offsets
- explain motivations

Growing controversy → Transparency
- foster an informed debate on biodiversity offsets
- based on practical evidence

Complexity and context dependency → Context sensitivity
- Inform context sensitive decision-making in policy & practice
- Clarify the roles and responsibilities of actors under different contexts
- Enable context specific evaluation of the outcomes and efficiency of biodiversity offsets
Thank you for your attention!

Discussion: Questions? Comments?

“Yes, I'd like to ask a very specific question that pertains only to me, and then go on and on and on...”

www.biodiversityoffsets.net

today

ongoing

www.biodiversityoffsets.net
Spare material
Background: Ongoing drastic loss of biodiversity negatively affects human wellbeing

Mid-term review of the EU biodiversity strategy to 2020
EU assessment of progress towards the targets and actions

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>2020 Headline Target</strong></td>
<td></td>
</tr>
<tr>
<td>Halt the loss of biodiversity and the degradation of ecosystem services in the EU by 2020, and restore them in so far as feasible, while stepping up the EU contribution to averting global biodiversity loss.</td>
<td></td>
</tr>
</tbody>
</table>

**Business as usual is not an option!**
**We need new tools!**
Introduction to the context for biodiversity offsets: from biodiversity loss to no net loss of biodiversity

In the light of ongoing biodiversity loss there is an increasing need for restoration based activities to complement conventional nature conservation activities. Building on this premise, the paradigm of “no net loss” has risen to prominence in a worldwide context and has particularly been introduced to EU policy. In this scope, biodiversity offsets are increasingly explored and promoted to reach the no net loss goal.

Biodiversity offsets are a tool for compensation for environmental impacts rooted in compensation schemes under the environmental legislation of countries like the US, Germany, Brazil and Australia.
Biodiversity offsets as part of the mitigation hierarchy

Biodiversity Offsets are defined as “measurable conservation outcomes” that are designed to counterbalance the unavoidable “significant residual adverse biodiversity impacts” on the environment from projects or development (BBOP 2012a).

Biodiversity offsets are the last step of a sequence, called the “mitigation hierarchy” (see Figure).
State of the Art

Antecedents of biodiversity offsets:

- Rooted in numerous compensation approaches in a number of countries
- Starting in the early 2000s new trend towards the promotion of voluntary biodiversity offsets
- Fostered by the Business and Biodiversity Offsets Program (BBOP) and pilot projects (e.g. in the UK)

<table>
<thead>
<tr>
<th>Country</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>EIA, Environmental Compensation Fund</td>
</tr>
<tr>
<td>Australia</td>
<td>Native Vegetation Offset Programs in Victoria, New South Wales and Western Australia, Biodiversity Banking and Offsets Scheme in NSW, BushTender Program and BushBroker System in Victoria</td>
</tr>
<tr>
<td>Brazil</td>
<td>Forest offsets, Project offsets and Conservation Units</td>
</tr>
<tr>
<td>China</td>
<td>Eco-compensation (in discussion), pilot projects (road planning, land consolidation, hydropower)</td>
</tr>
<tr>
<td>Egypt</td>
<td>EIA/ESIA, sectoral guidelines for major projects</td>
</tr>
<tr>
<td>France</td>
<td>doctrine ERC, habitat banking pilots</td>
</tr>
<tr>
<td>Germany</td>
<td><strong>Impact Mitigation Regulation</strong></td>
</tr>
<tr>
<td>India</td>
<td>Biological Diversity Rule, Mitigation Schemes and Wetland Mitigation Schemes (under development)</td>
</tr>
<tr>
<td>Madagascar</td>
<td>sectoral EIA guidelines for major projects, MEC for existing companies</td>
</tr>
<tr>
<td>Mexico</td>
<td>EIA, Program for Environmental Justice</td>
</tr>
<tr>
<td>South Africa</td>
<td>EIA, Guidelines for Biodiversity</td>
</tr>
<tr>
<td>South Korea</td>
<td>Substitute Habitats for Dams, Wetland Mitigation Banking (in discussion), Pilot Projects on Impact Mitigation Regulation</td>
</tr>
<tr>
<td>United States</td>
<td><strong>Wetland Mitigation</strong>, Species Banking</td>
</tr>
</tbody>
</table>

Selected compensation approaches worldwide

Source: modified after Darbi et al. 2010
State of the Art: Biodiversity Offsets in research

Grey literature → scholarly literature

Theoretical challenges:
- No Net Loss vs. Net Gain
- Counterfactuals / frames of reference
- Currency
- Equivalence
- Longevity
- Time lag
- Uncertainty
- …

Growing use of the term “biodiversity offsets” in the scholarly literature
Source: Maron et al. 2015a (Data Source: Google Scholar/Scopus)
State of the Art: Biodiversity Offsets in research

- The metric
- Terms of exchange
- Long term delivery
- Conservations covenants
- Net gain
- location
- thresholds
- Additional -ity
- species
- hedgerows
Research hypotheses

1. Differences exist regarding the voluntariness of biodiversity offsets.
2. Biodiversity offsets cannot be adequately explained as a dichotomy of mandatory vs. voluntary offsets.
3. The voluntariness of biodiversity offsets can be described as a gradual continuum.
4. A typology of biodiversity offsets (and different types) can be build to analyse and illustrate the space between the two poles of this continuum.
5. These types help to analyse and understand the different outcomes of biodiversity offsets.
Research design and structure

In the research question three issues are highlighted:
- Biodiversity offsets
- Voluntariness
- Methodological considerations: including 1) an internet and expert based research approach and 2) typification

These research issues pass through three methodological complexes:
- Establishment of the theoretical and methodological baseline
- Empirical development and analysis of the typology of voluntary biodiversity offsets (theoretically-grounded)
- Discussion and conclusions of the typology, outlook
Cyberscience in the age of the internet
Source: author’s own
Science 2.0 and the Web 2.0

--- Current methods ---
- Form hypothesis
- Gather data privately; test
- Write journal article
- Submit for review
- Peer-review gatekeepers?
- Publish

--- Emerging methods ---
- Form hypothesis
- Share ideas, methods, data with other scientists online via blogs, video journals, social networks, and other methods
- Test, perform experiments
- Share findings online in preliminary form
- Publish in blogs, wikis, as well as journals

Current and emerging methods in science
Source: Tomwsulcer 2012

Development from Web 1.0 to Web 2.0
source: Müller and Schumann n.d.
Definition of key terms

Voluntariness:

• characterizes the nature of the motivation for an action, i.e. the degree an action is externally or internally induced. (Ammann 2004, Gutmann 2000, Wolf 1740)

• is a normative concept shaped by context (Priller 2008, Putnam 2000, Flatmann 1992)

Altruism:

• refers to a motivational state with the ultimate goal of increasing another’s welfare / public welfare. (Batson 2014, Liebe, Preisendörfer & Meyerhoff 2011)
Combination of attributes and substruction of the underlying attribute space

Which of the criteria are suited to construct the underlying attribute space from?

→ Containment/reduction through a process of elimination

• Rejected criteria: Causality, Free choice, Scope or distance of voluntary action, Know-how/ professionalism, Taking over Responsibility, Ethics

• Threshold criteria: intentionality, additionality

• Performance criteria: flexibility, cost efficiency

• Quality criteria (relative to the quality of an offset): charitableness, outcome and effectiveness

Remaining core criteria:

- Context → descriptive criterion (cannot be qualified by different values)
- Influence and initiators
- Choice, eligibility and alternatives → secondary criterion to influence and initiators
- Motivation → group together motivation and ultimate goal
- Ultimate goal → group together motivation and ultimate goal
- Recompense or benefit → secondary criterion to motivation and ultimate goal

A combination of two suitable criteria remains:

1. Influence and initiators and 2. Motivation and ultimate goal
1. **Regulatory offsets**: required by law and enforced

2. **Conditional offsets**: required by financial institutions e.g. WB, IFC

3. **Enabled offsets**: required by financial institutions e.g. WB, IFC
   a) fostered by governments through pilot schemes, guidance etc.
   b) initiated by new global norms e.g. by BBOP or IUCN

4. **Sectoral offsets**: taking part in a voluntary self-commitment of a sector (e.g. mining)

5. **Corporate offsets**: resulting from a voluntary self-commitment of a corporation

6. **Local offsets**: single offsets, developed at local level in a consensual process
   a) Reputational risk
   b) License to operate

7. **Altruistic offsets**: driven by the altruistic motivation towards public welfare (truly voluntary)

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**Results: conceptual framework – 7 types**

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<td>Case 3a (enabled: government)</td>
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<td><strong>Financial institute</strong></td>
<td>Case 2 (conditional)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sector</strong></td>
<td>Case 4 (sectoral)</td>
<td></td>
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<td><strong>Corporation</strong></td>
<td>Case 5 (corporate)</td>
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<tr>
<td><strong>Local community</strong></td>
<td>Case 6a (local: reputational risk)</td>
<td>Case 6b (local: license to operate)</td>
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<tr>
<td><strong>NGOs</strong></td>
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<tr>
<td><strong>Without major influence</strong></td>
<td></td>
<td></td>
<td>Case 7 (pure altruism)</td>
</tr>
</tbody>
</table>
Illustrative case studies

7 illustrative case studies (one for each type):
→ e.g. case study for conditional offsets – Nam Theun 2 Hydropower project in Laos
Illustrative case studies: 2. conditional offsets

1. General description: leading lending financial institutions (WB, IFC, EBRD) increasingly define conditions for financing large development projects (infrastructure, mining etc.) → IFC PS6

2. Case study: Oyu Tolgoi, Mongolia (huge copper/gold mine operated by Rio Tinto in southern Gobi)

3. SWOT analysis

### Illustrative case studies: 2. conditional offsets

<table>
<thead>
<tr>
<th>Criteria group</th>
<th>Criteria</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threshold criteria</td>
<td>intentionality</td>
<td>yes, no (overcompliance)</td>
</tr>
<tr>
<td></td>
<td>additionality</td>
<td>yes, no</td>
</tr>
<tr>
<td>Core criteria</td>
<td>influence and initiators</td>
<td>IFC PS6, Rio Tinto's corporate biodiversity strategy</td>
</tr>
<tr>
<td></td>
<td>choice</td>
<td>increased, neutral, <strong>reduced</strong>, highly reduced</td>
</tr>
<tr>
<td></td>
<td>Motivation</td>
<td><strong>pressure, incentive, altruism</strong></td>
</tr>
<tr>
<td></td>
<td>ultimate goal</td>
<td><strong>compliance, additional benefit, gain acceptance</strong></td>
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<tr>
<td></td>
<td>benefit</td>
<td>potential for becoming a developer of choice, including access to land / resources and a seat at the policy table</td>
</tr>
<tr>
<td>Context criteria</td>
<td>legislation</td>
<td>integration of the offset strategy with national/regional government policies for natural resource management and nature conservation</td>
</tr>
<tr>
<td></td>
<td>Competitive environment</td>
<td>Private sector development is impeded by a “harsh climate, small domestic market, human resource constraints, infrastructure bottlenecks, corruption, legal inadequacies, weak contract enforcement, and poor capital markets”</td>
</tr>
<tr>
<td></td>
<td>Cultural and social context</td>
<td>“undermined living standards and hampered growth”</td>
</tr>
<tr>
<td>Quality criteria</td>
<td>Charitableness / public good</td>
<td>aiming for Net Positive Impact</td>
</tr>
<tr>
<td></td>
<td>Outcome and effectiveness</td>
<td>At a high-level PS6 and BBOP Principles can be met, but some of the details are more challenging.</td>
</tr>
<tr>
<td>Performance criteria</td>
<td>flexibility</td>
<td><strong>to be further evaluated</strong></td>
</tr>
<tr>
<td></td>
<td>Cost efficiency</td>
<td><strong>to be further evaluated</strong></td>
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</tbody>
</table>
Results: Discussion of the typology

Magnitude, location and particularities of the types

Differences between the types:
- Scale of development impacts
- Sectors/developments addressed
- Governance of the implementation

Similarities and overlap between the types

Limitations of the typology:
- Temporal aspects of biodiversity offsets
- Demand and supply side for biodiversity offsets

Type 5 corporate offsets: map of attributed cases from the worldwide screening
Critique of methodology

 Appropriateness of the research methodology:

 1. Did the internet- and expert-based research approach prove to be applicable and deliver appropriate results?
 2. What are the main strengths and constraints?
 3. Do alternative approaches exist to reach the envisaged goal?

 Mixed types – the limits of typification to represent real world examples

 Difficulties of comparability and clear classification of offsets

 1. What counts as an offset?
 2. Global differences in offsets
Discussion of the research hypotheses

Hypotheses:

1. Differences exist regarding the voluntariness of biodiversity offsets. → Confirmed

2. Biodiversity offsets cannot be adequately explained as a dichotomy of mandatory vs. voluntary offsets. → Confirmed

3. The voluntariness of biodiversity offsets can be described as a gradual continuum. → Refuted: Voluntariness builds on the intersection of several qualitative criteria → a hierarchical sequence from mandatory to voluntary can only be constructed normatively & no universal ranking can be derived → Confirmed

4. A typology of biodiversity offsets (and different types) can be build to analyse and illustrate the space between the two poles of this continuum. → Confirmed

5. These types help to analyse and understand the different outcomes of biodiversity offsets. → Partially confirmed (not the focus of this study)
Application— what can the typology be used for?

Summarizing, the typology of (voluntary) biodiversity offsets contributes to:

→ Increase transparency
→ Structure and differentiate
→ Take into consideration different contexts, drivers and motivations
→ Enable to build a broader evidence base (through methods and tools)
→ Provide a first number of (72) cases (thereof six described in more detail) as part of this evidence base.
→ Foster an informed debate on biodiversity offsets building on specifications, context and evidence
→ Set the prerequisite for the evaluation of the outcome of biodiversity offsets both regarding procedural aspects (governance, efficiency etc.) and added nature conservation value (effectiveness, additionality, achievement of the goal of no net loss/net gain)
→ Clarify the role of different stakeholders, e.g. a more sophisticated understanding of the role of government that goes beyond the conventional understanding in terms of regulator and enforcing authority
Trends: which of the offset types are promising?

Offset regulation:
1. regulatory offsets

Cooperative approaches:
3. enabled offsets

Corporate responsibility:
5. corporate offsets

Lender requirements:
2. conditional offsets
Results III: Discussion of the typology

Magnitude, location and particularities of the types

Differences between the types

1. Scale of development impacts
2. Sectors/developments addressed
3. Governance of the implementation

Similarities and overlap between the types

Limitations of the typology

1. Temporal aspects of biodiversity offsets
2. Demand and supply side for biodiversity offsets

Type 5 corporate offsets: map of attributed cases from the worldwide screening
Magnitude, location and particularities of the types

Differences between the types
1. Scale of development impacts
2. Sectors/developments addressed
3. Governance of the implementation

Similarities and overlap between the types

Limitations of the typology
1. Temporal aspects of biodiversity offsets
2. Demand and supply side for biodiversity offsets

<table>
<thead>
<tr>
<th>Sectors</th>
<th>Type 1</th>
<th>Type 2</th>
<th>Type 3</th>
<th>Type 4</th>
<th>Type 5</th>
<th>Type 6</th>
<th>Type 7</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining</td>
<td>7</td>
<td>5</td>
<td>4</td>
<td>12</td>
<td>12</td>
<td>3</td>
<td>3</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>(8, 24, 27, 31, 36, 49, 72)</td>
<td>(4, 18, 60, 68, 72)</td>
<td>(1, 5, 23, 30)</td>
<td>(2, 5, 12, 13, 14, 15, 18, 19, 25, 49, 59, 68)</td>
<td>(6, 51, 70)</td>
<td>(47, 64, 69)</td>
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<td>Oil and gas</td>
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<td>(9)</td>
<td>(20, 21, 53)</td>
<td>(16, 20)</td>
<td>(32)</td>
<td>(50)</td>
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<td>Infrastructure</td>
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<td>9</td>
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<td>(54, 66)</td>
<td>(37, 44, 52)</td>
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<td>(52, 56)</td>
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<td>Housing/real estate</td>
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<td>Energy</td>
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<td>(26, 33, 46)</td>
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<td>Other industry</td>
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<td>-</td>
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<tr>
<td></td>
<td>(57, 58)</td>
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</table>

Type 5 corporate offsets: map of attributed cases from the worldwide screening
Results III: Discussion of the typology

Magnitude, location and particularities of the types

Differences between the types
1. Scale of development impacts
2. Sectors/developments addressed
3. Governance of the implementation

Similarities and overlap between the types

Limitations of the typology
1. Temporal aspects of biodiversity offsets
2. Demand and supply side for biodiversity offsets

Type 5 corporate offsets: map of attributed cases from the worldwide screening
Key messages and lessons learnt

Growing variety

Differentiation

The typology helps to describe the variety of biodiversity offsets and to explain motivations.

Growing controversy

Transparency

The typology fosters an informed debate on biodiversity offsets based on a conceptual framework and practical evidence.

Biodiversity offsets are complex and highly context dependent

- Inform context sensitive decision-making in policy and practice
- Clarify the roles and responsibilities of actors under different contexts
- Enable context specific evaluation of the outcomes and efficiency of biodiversity offsets
Outlook and further research

1. Appropriateness

Survey on the Biodiversity Offsets Blog (Source: author's own)
Outlook and further research

1. Appropriateness
2. Empirical base

Offset and Compensation Programs and Banks by Region
Source: Screenshot from www.speciesbanking.com
Outlook and further research

1. Appropriateness
2. Empirical base
3. Evaluation

SWOT analysis as an evaluation tool (Source: Dahp 2015)