Module 6 – Impact Assessment

Training Modules for Applying the Mitigation Hierarchy: Planning Policy and Projects for No Net Loss or a Net Gain of Biodiversity

Module 6
Types of impacts on biodiversity and types of impact assessment.

Impact Assessment – Abstract

Application of the mitigation hierarchy and planning for NNL/BNG can be integrated into environmental and social impact assessments.

This module covers the impact assessment process, starting with an exploration of direct, indirect and cumulative impacts and then covering baseline studies on biodiversity.

The next topic is the assessment of projects' impacts – within their footprint and beyond, with a consideration of a variety of typical impacts from projects in different industry sectors. Presentation of the outcomes of impact assessments are raised, with some reflections on challenges with EIAs, which do not automatically deliver NNL/BNG.

The next section touches on how anticipated impacts can be managed by following the mitigation hierarchy, with consideration of alternatives analyses, and consideration of how to manage impacts on sensitive (high conservation value) biodiversity.

A section on Environmental Management Plans and Biodiversity Action Plans is followed by some take home messages.

Impact Assessment Module - Contents

Contents	Slides
Introduction to EIA in the project cycle and direct, indirect and cumulative impacts	4-18
Baseline studies on biodiversity – project area, high biodiversity values, threats, information on surveys, seasonality, completeness, synthesis	19-45
Assessing projects' impacts – project impacts, footprint and beyond, and typical impacts for projects in a variety of industry sectors: roads, oil and gas, wind power, hydropower, mines, tourist, agriculture and forestry, urban development	46-62
Presenting outcomes of impact assessments. Will EIAs deliver BNG? Challenges with EIAs	63-70
Managing impacts: following the mitigation hierarchy, especially alternatives analyses	71-79
Managing impacts on sensitive biodiversity	80-92
Environmental Management Plans and Biodiversity Action Plans	93-109
Take home messages	110

Understanding impacts: introduction

What is an EIA?

It's a process:

- Preparing a report on the impacts of a project on the environment, including biodiversity (species, habitats, processes, etc.)
- Consulting stakeholders
- Review by the permitting authority

An EIA is not just a document!

It's information for making decisions

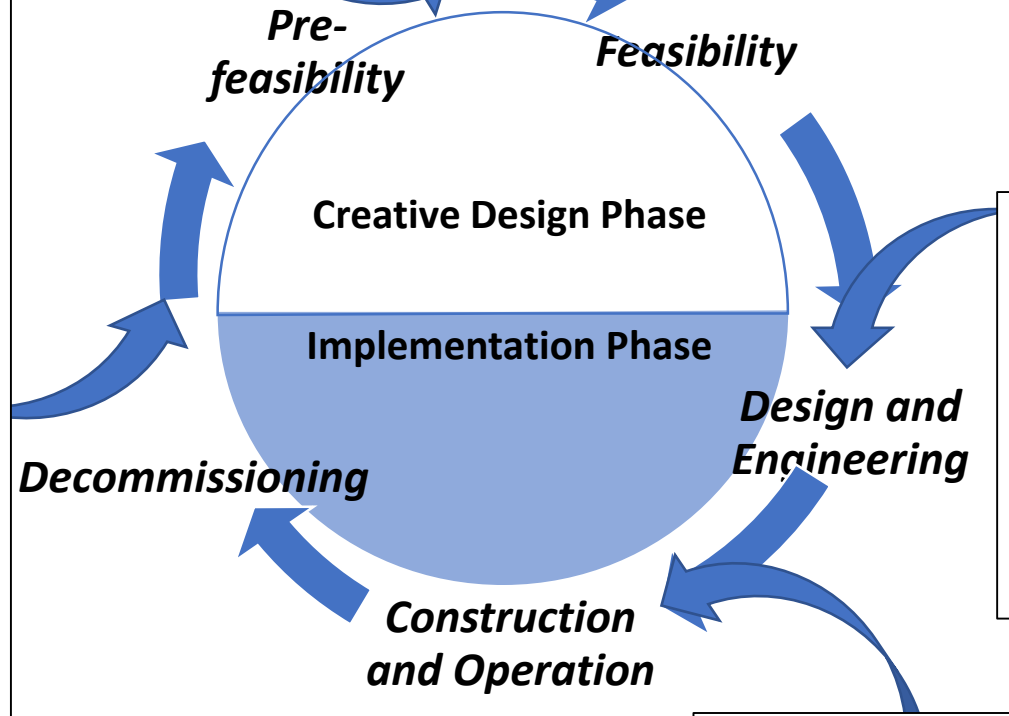
- The project proponent: to make changes to the project, including targeted mitigation and offsettting measures
- Stakeholders and the public
- Permitting authority

The quality of the EIA determines the environmental outcomes of a project

EIA in the project cycle

Detailed assessment of impacts including residual impacts, identification of mitigation measures, input to cost-benefit analysis

Site selection, social and environmental screening, review of alternatives, initial assessment, scoping of significant issues including mitigation



Implementation of mitigation measures acc. to management plans, and social and environmental strategy

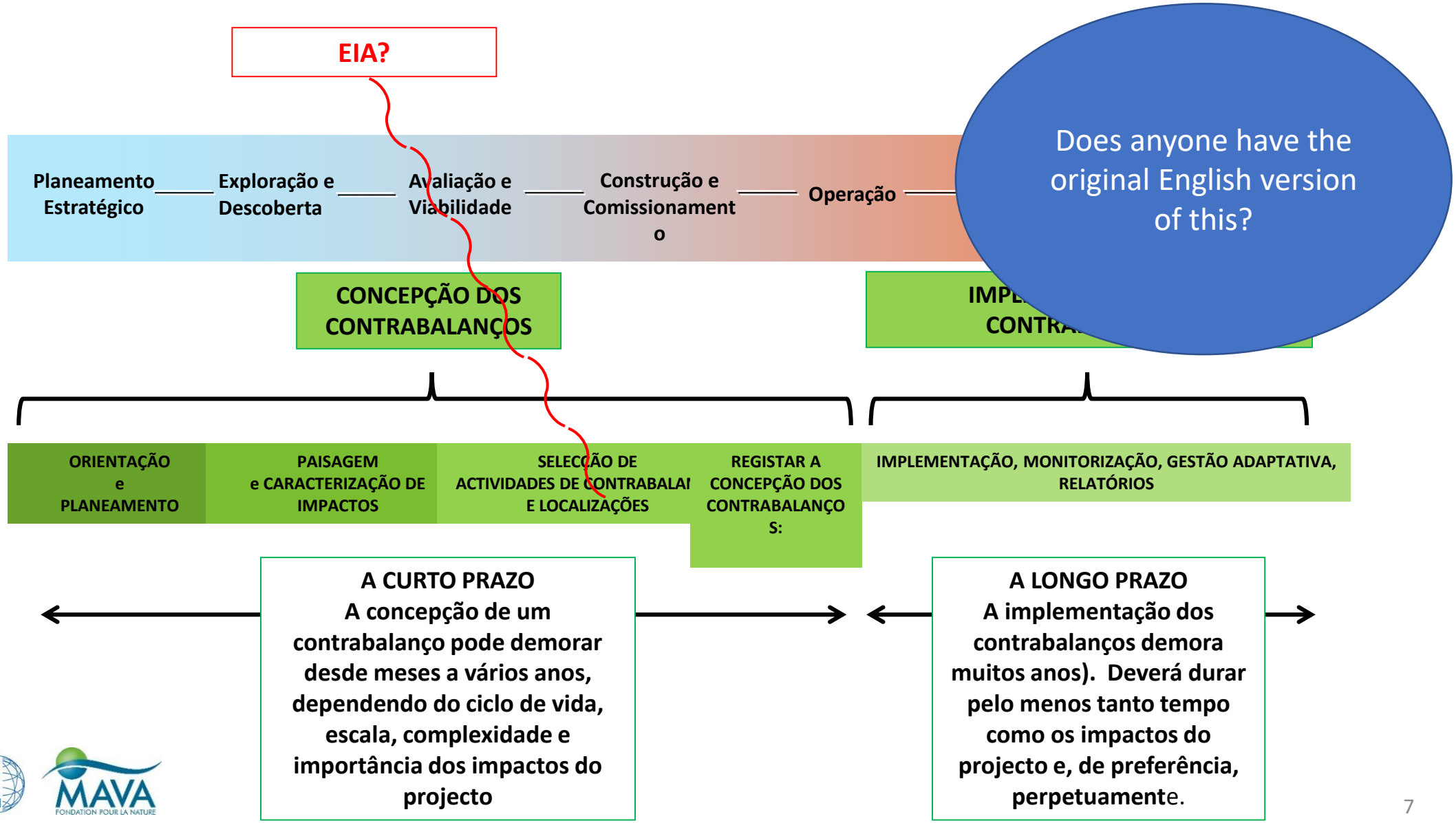
Monitoring and auditing, adaptive management

Design

Planning

- Strategies and Policies
- Finance
- Feasibility Studies and Technical Studies
- Project Design
- Planning EIA and other regulations
- Project Implementation and Monitoring

Life cycle of project and offset



Does anyone have the original English version of this?

Key points

- Which biodiversity features are present?
  - Natural habitats (terrestrial, aquatic, marine …)
  - Species and their habitat requirements
  - Ecological processes (connectivity, water cycle, etc.)
- What is their importance?
  - Legal status
  - Conservation status
- What is their sensitivity to the likely impacts?
  - Permanent vs. temporary
  - Construction and/or operations

- What is the proposed mitigation?
  - Avoidance
  - Minimization
- What are the residual impacts?
  - Are residual impacts acceptable?
  - How will they be offset?

Direct, Indirect and Cumulative Impacts

- **Direct impacts:** An outcome directly attributable to a defined action or project activity. (Often called 'primary impact'.)

  E.g.: loss of habitat flooded by a dam.

- **Indirect impacts:** impacts triggered in response to the presence of the project, rather than being directly caused by the project's own operations. (Sometimes called 'secondary' or 'induced' impacts.)

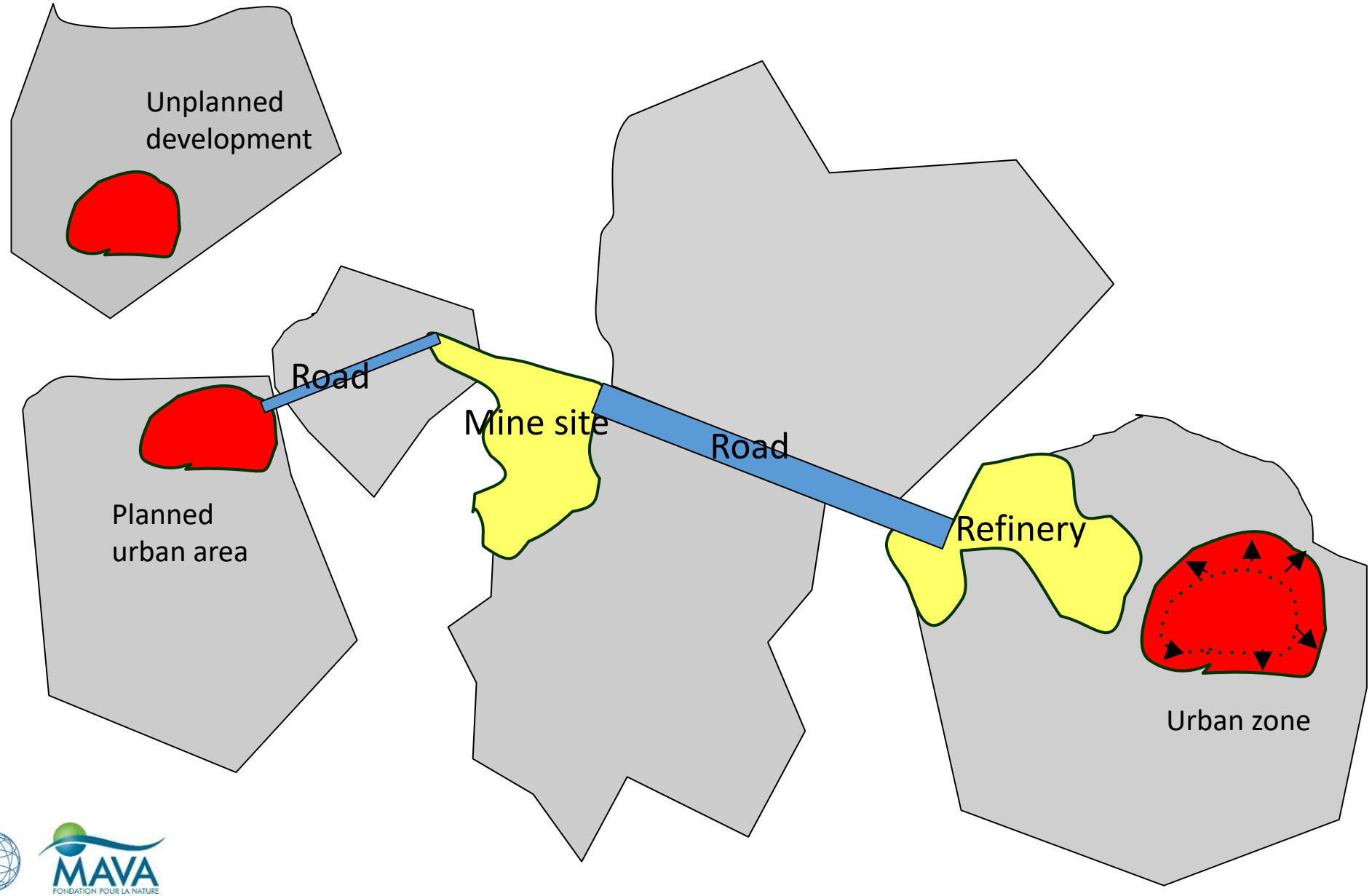
  E.g.: the presence of a mine may lead to an increased local workforce with knock-on effects on biodiversity, due to increased land conversion and levels of hunting.

- **Cumulative impacts:** the totality of impacts that ultimately arise from a single project or the combination of a series of activities. Cumulative impacts are likely to arise from activities under the control of the developer, but also from related activities and from other background pressures for which responsibility and control rest with others (e.g. government and local communities).

  E.g.: a housing development on the edge of a wetland may add to pressures on the wetland from other developments (such as construction of other residential and commercial buildings, roads, local agricultural intensification, etc).

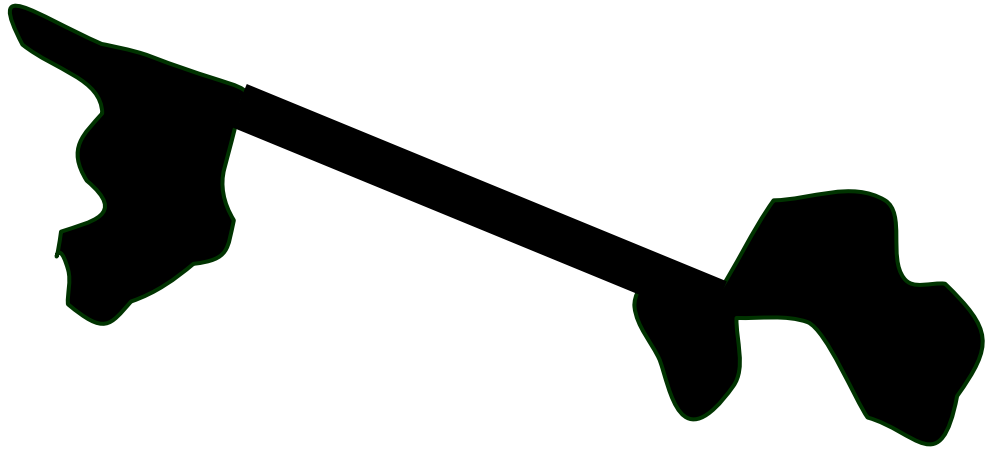
➔ While an individual project's impacts may be manageable, its indirect and cumulative impacts may be irreversible and too severe to be capable of being offset.

Direct and indirect impacts



Direct and indirect impacts

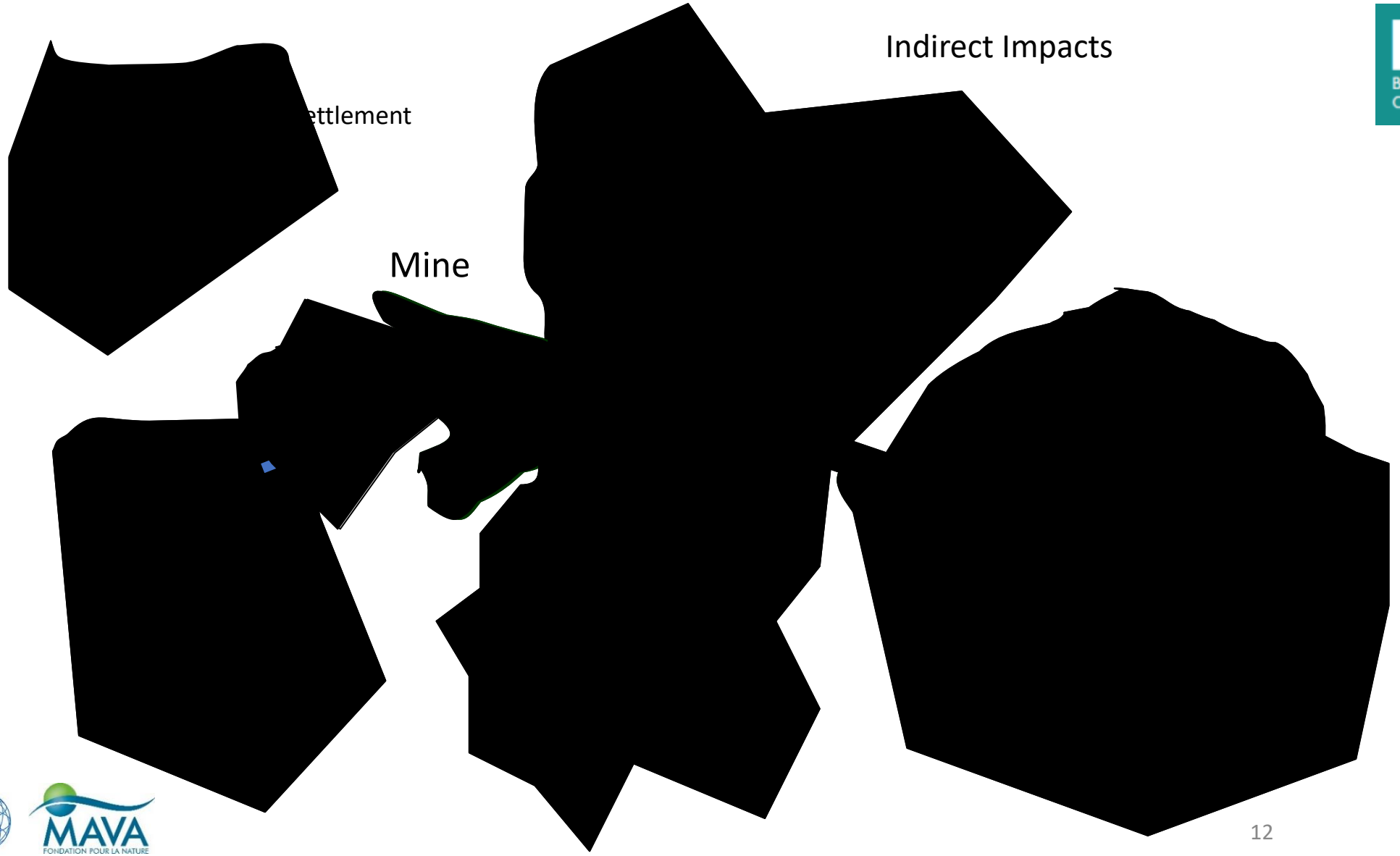
Direct impacts



Source: BBOP

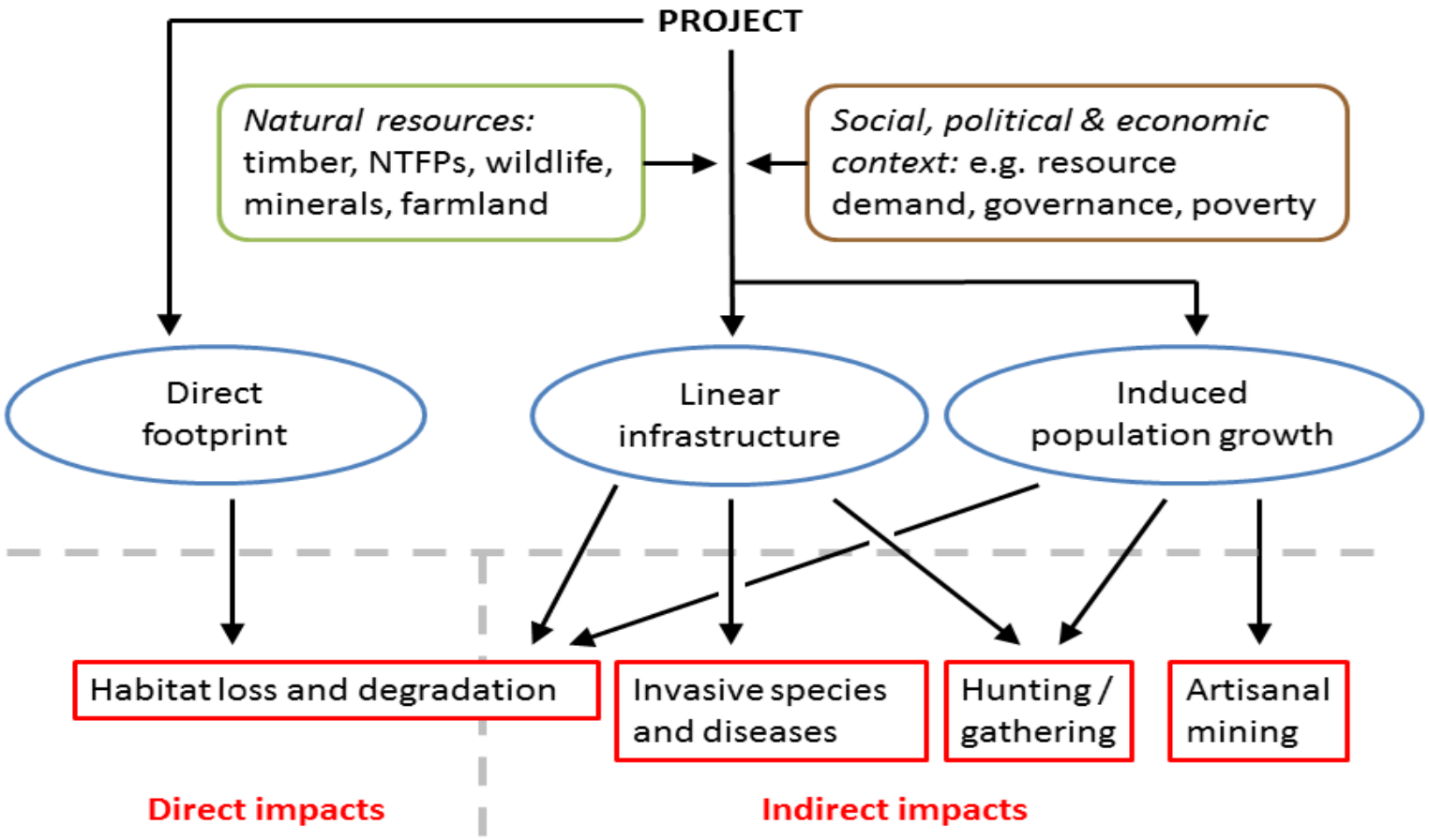
11

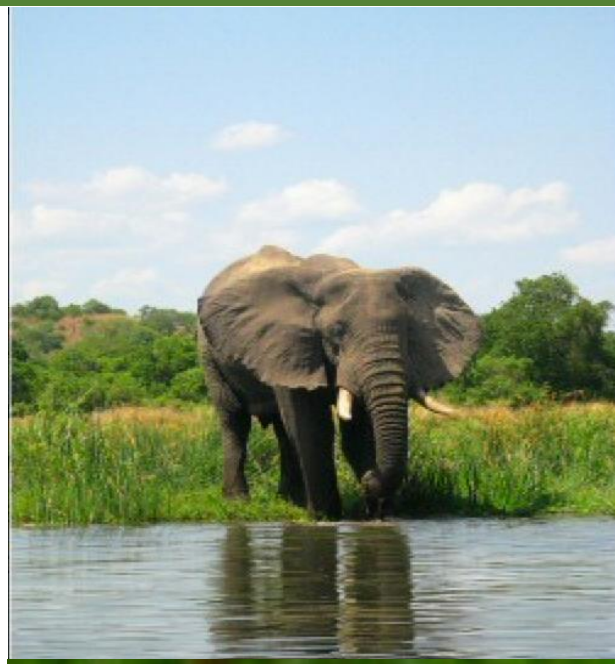
Direct and indirect impacts



12

Direct and indirect impacts





Indirect impacts

Indirect impacts: Impacts triggered in response to the presence of the project, rather than being directly caused by project activities. (Sometimes known as 'secondary' or 'induced' impacts.)

E.g.: The presence of a drilling rig can mean a greater local work force with greater impacts on biodiversity, due to a change in land-use and increased hunting.

Does this well pad mean:

Just 1 hectare of impact? Or much bigger impact through:

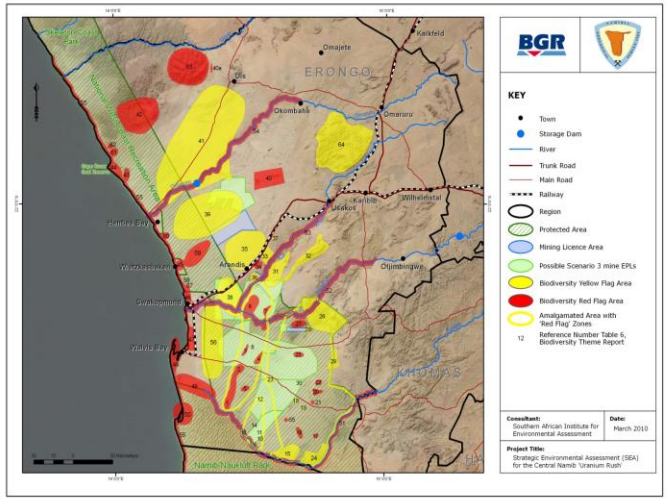
- blocking the passage of animals
- impacts of inmigrants
- four times the consumption of fish taken to market on drilling access roads.

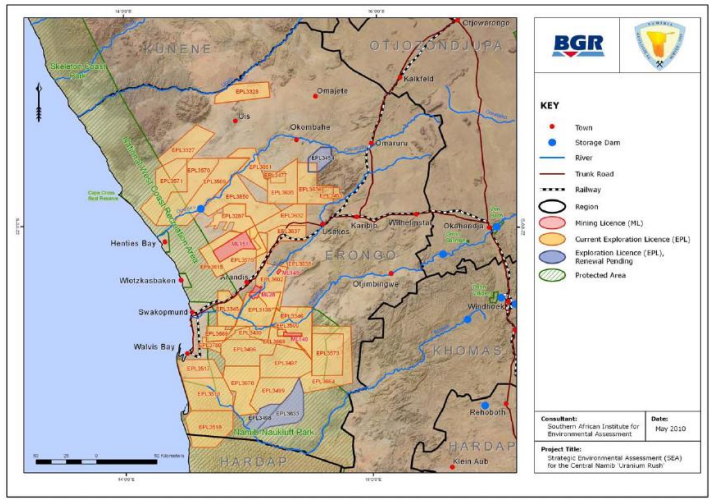
While the impact of a single project may be manageable, its indirect and cumulative impacts may be irreversible and too serious to be compensated!

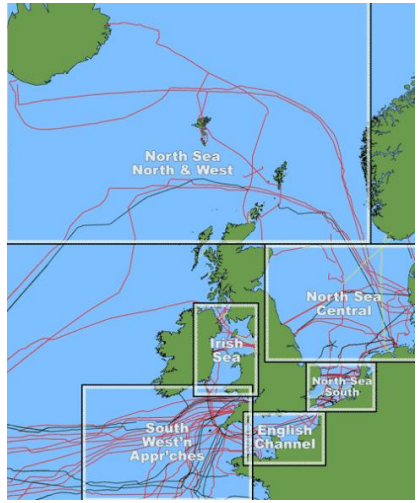
Direct, indirect and cumulative impacts

Cumulative impacts: The totality of all the impacts generated by a single project or by a combination of a series of activities. Includes impacts under the control of the developer, but also impacts from associated activities and other sources of pressure where responsibility and control lies with third parties (e.g. government and local communities).

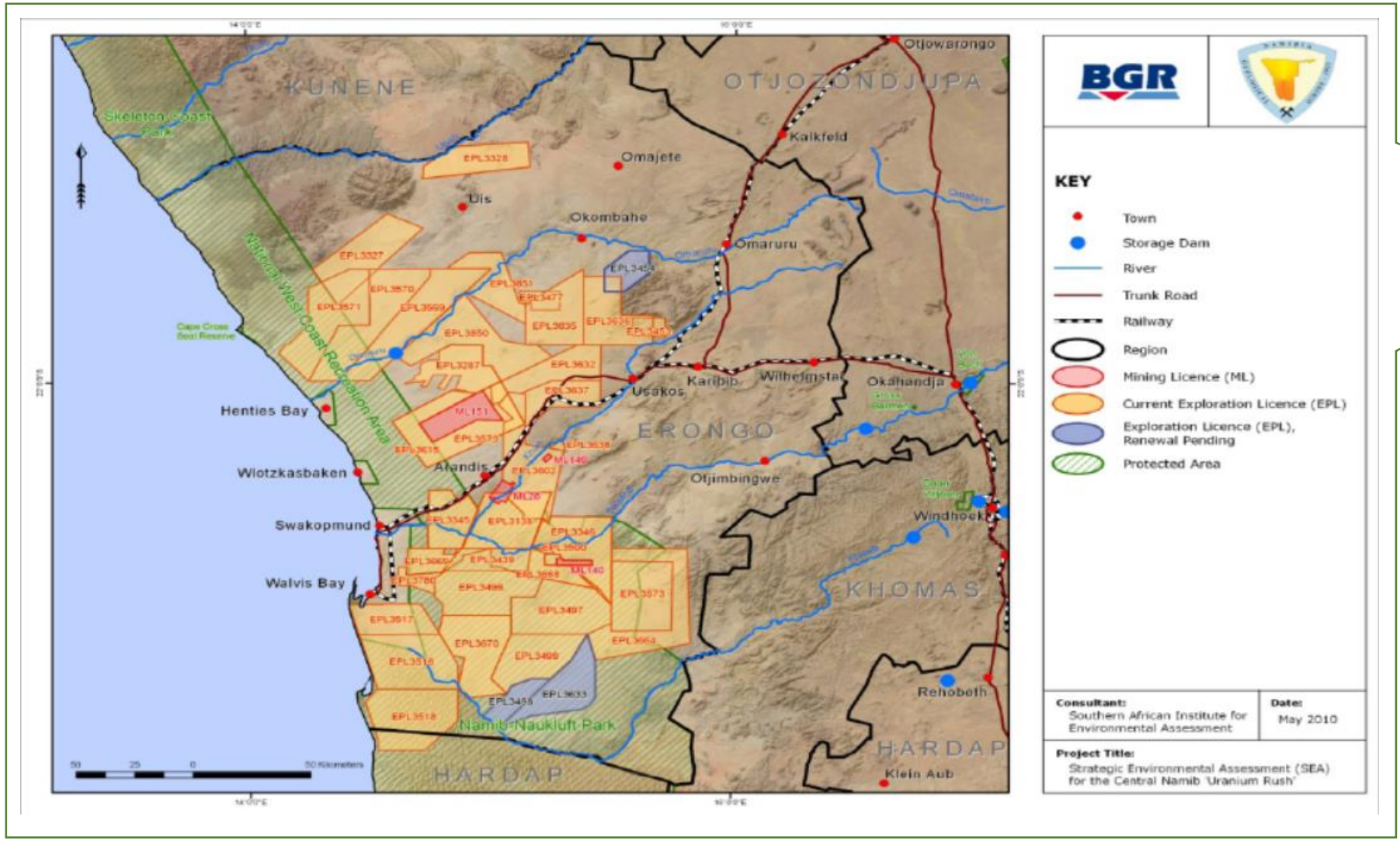
E.g. A housing project near a wetland adds to the pressure on the wetland from other projects (e.g. construction of other commercial and housing buildings, roads, intensification of the local agricultural, etc.)







Cumulative impacts - example



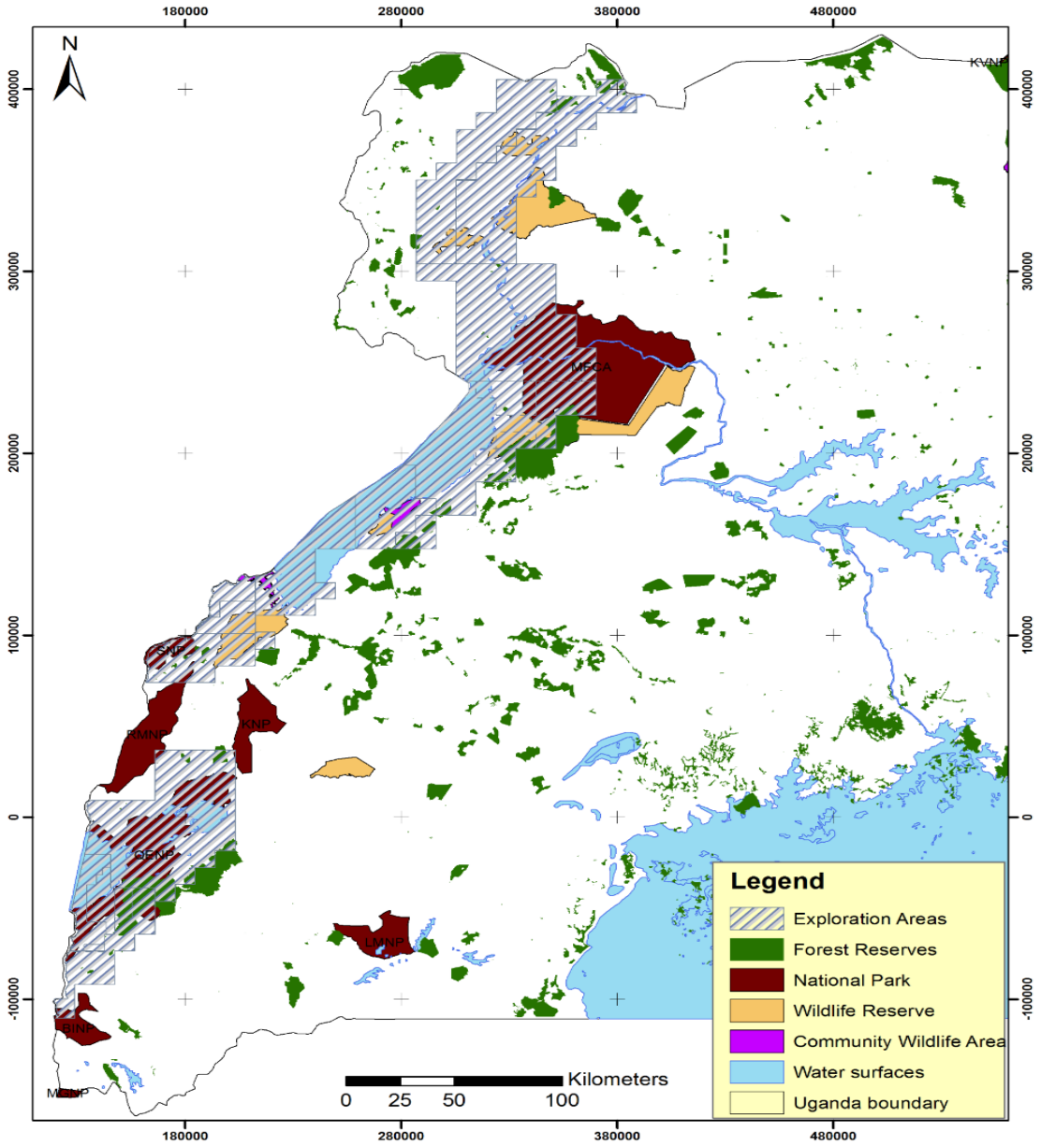
Source: Namibia SEA

16

Cumulative impacts - example

A housing development on the edge of a wetland may add to pressures on the wetland from other developments (such as construction of other residential and commercial buildings, roads, local agricultural intensification, etc).

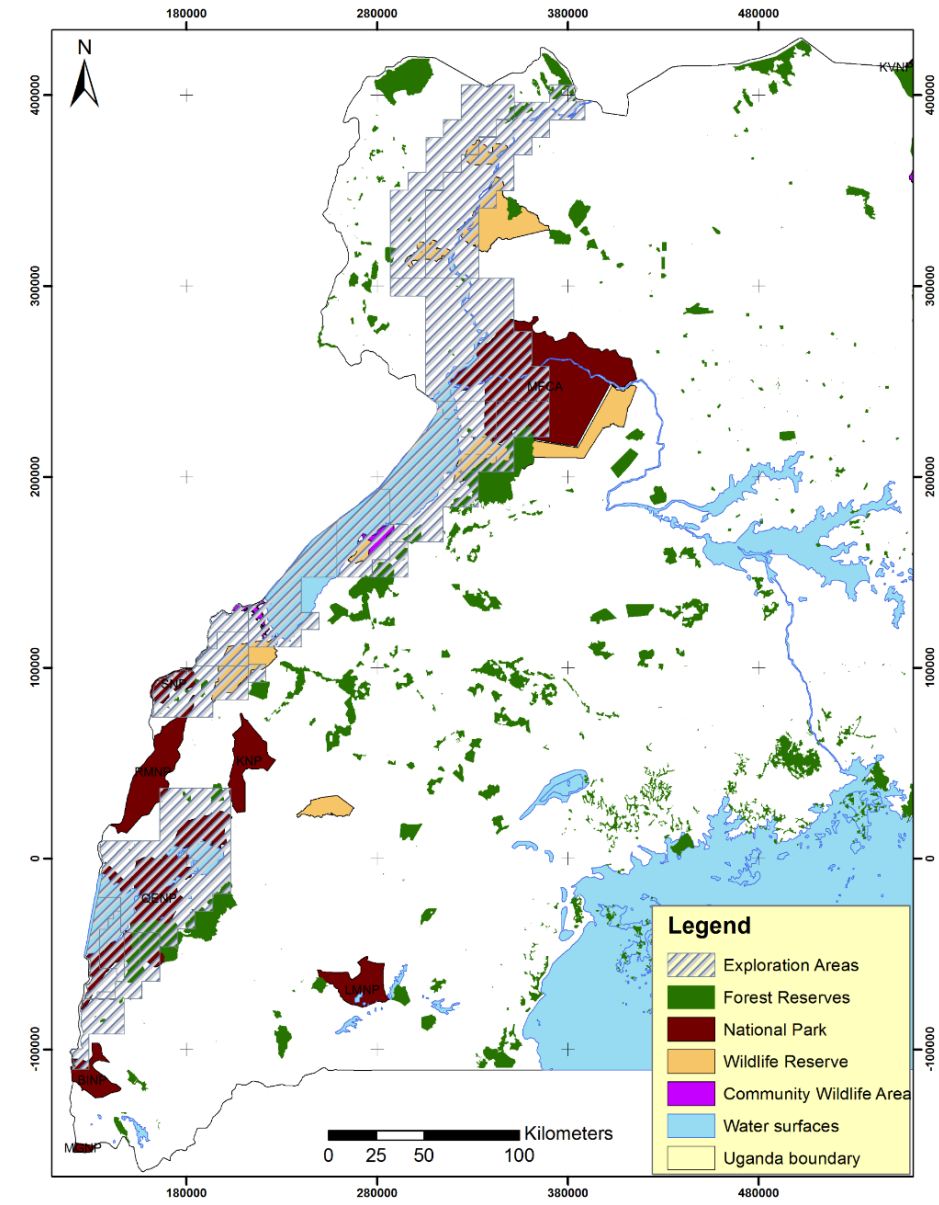
➔ Indirect and cumulative impacts may be irreversible and too severe to be capable of being offset



Cumulative impacts

- Impacts caused by an action **in combination** with other past, present and future human actions.
- Indirect and cumulative impacts may be irreversible and too severe to be capable of being offset

1. First, develop list of those impacting on important biodiversity. Where possible identify how much impact they are having.
2. Second, broadly estimate the baseline condition of the key feature and potential ongoing total cumulative impact.
3. Third, superimpose project impacts with those ongoing impacts.



Understanding impacts: Pre-impact baseline studies on biodiversity

Key points

- Project location relative to key biodiversity areas
- Study areas for biodiversity
- Who did the work and how?
  - Expertise
  - Seasonality
- Quality of baseline data
  - Completeness
- Analysing data
  - Mapping habitats and species
  - Red data lists
  - Sensitivity maps

Setting the stage : where is the project?

A description of the project's location relative to:

- Administrative boundaries
- Vegetation and land-uses
- Protected areas
- Conservation priorities / commitments
- Human population density
- Infrastructure and major industries

Atlas with maps :

- National level
- Provincial level
- Landscape level

Description of the ecological landscape (50-200 km radius) in which the project is set

- Topography & geomorphology
- Geology and soils
- Climate and extreme weather events
- Main ecological units (intact forest blocks, coral reefs, floodplains … based on referenced typology)
- Main land-uses and natural-resource uses (including illegal activities)

Does the EIA include maps that locate the project at the national and landscape level?

Does the EIA include maps that describe the main ecological units around the project?

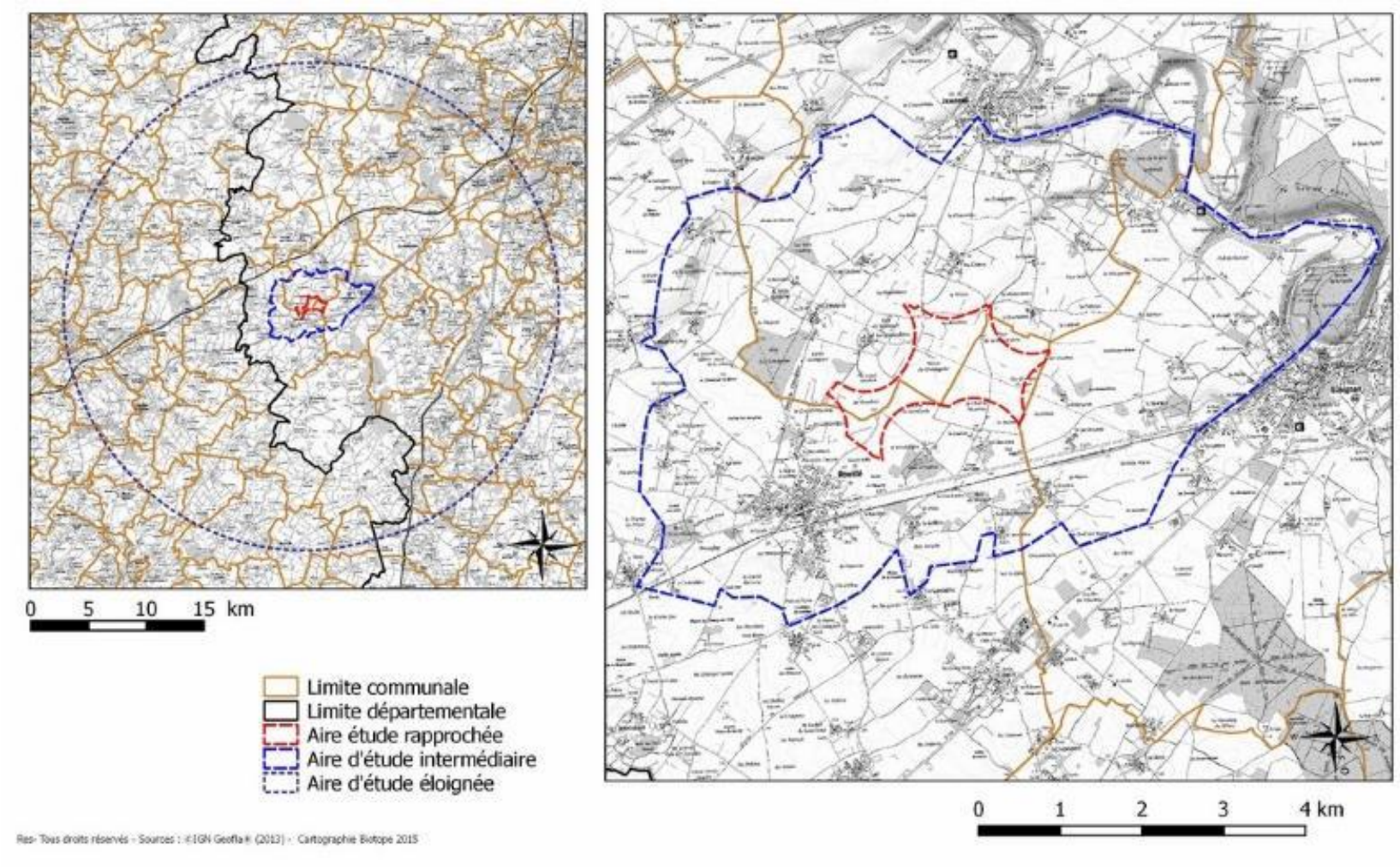
What is the study area?

- Landscape-level
- Intermediate distance
- Immediate proximity

Does the EIA define a study area?

How is it justified?

Ecologically?



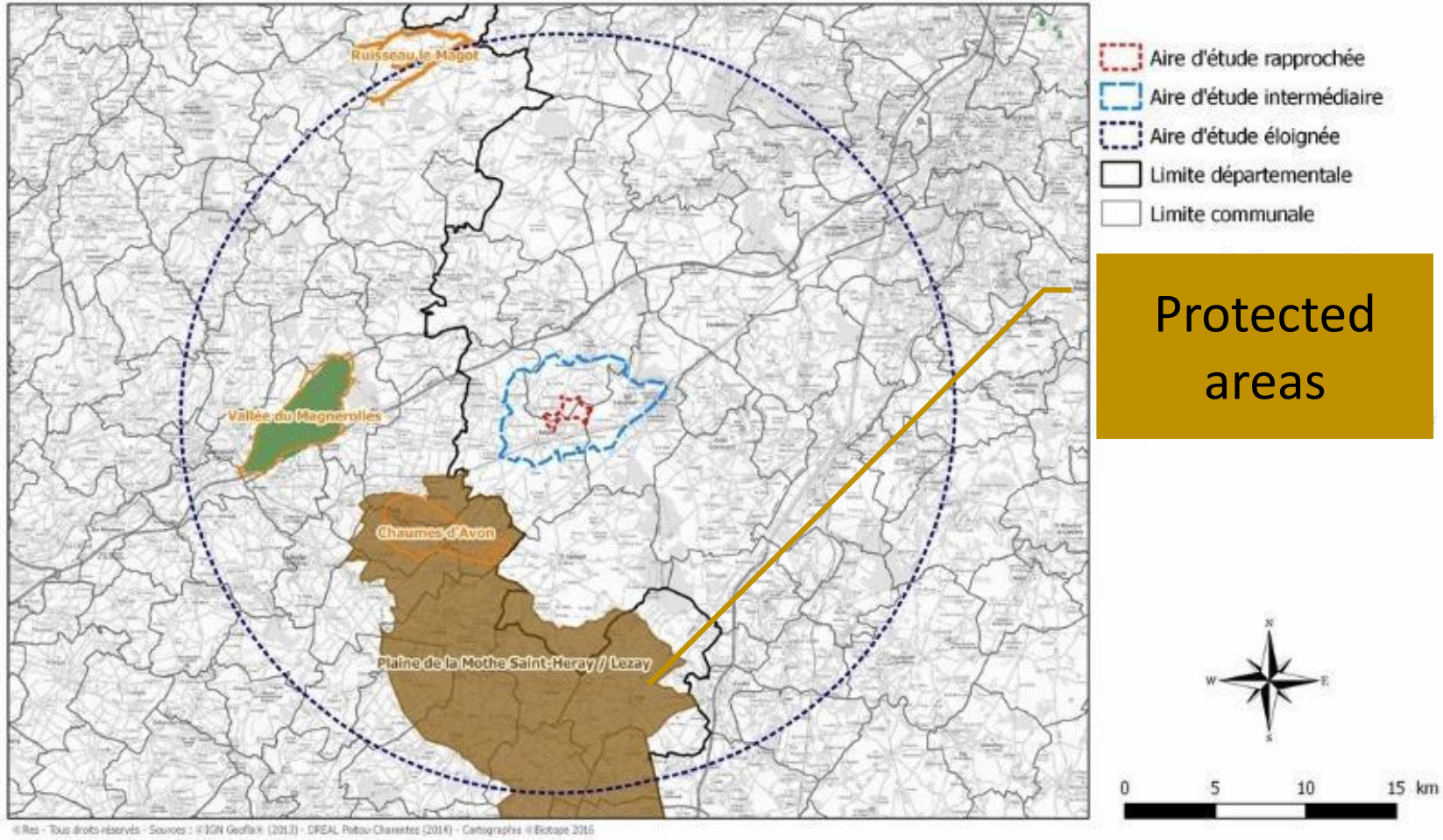
Wind power plant in France

Are there any protected areas?

Project location relative to protected areas is essential

It's part of avoidance

Does the EIA locate the project relative to existing and planned protected areas (on a map)?



Wind power plant in France

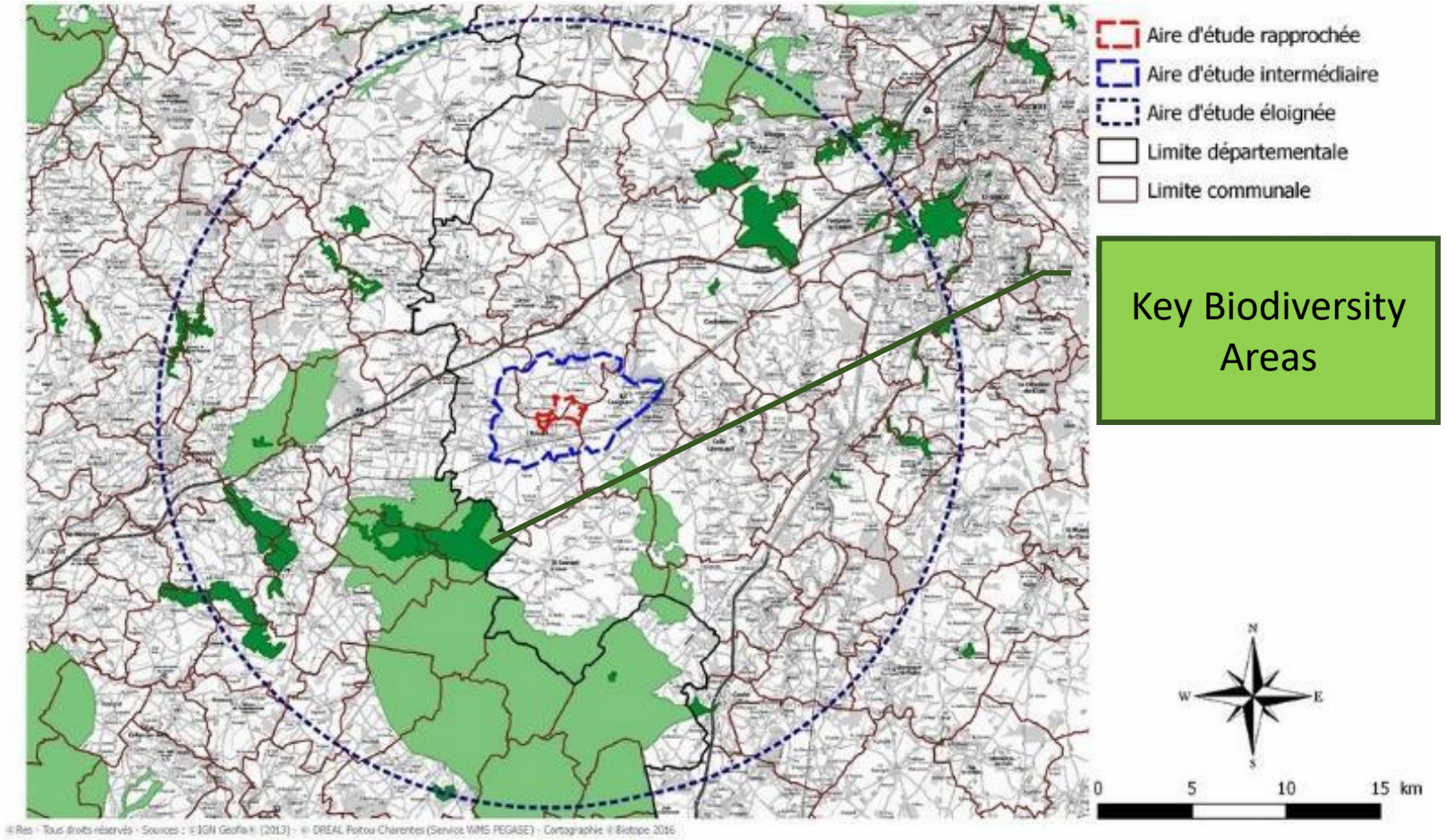
Are there recognized areas of biodiversity value?

Project location relative to areas known for their biodiversity importance

Example: Key Biodiversity Areas (KBA)

It's part of avoidance

Does the EIA locate the project relative to know key biodiversity areas (on a map)?



Wind power plant in France

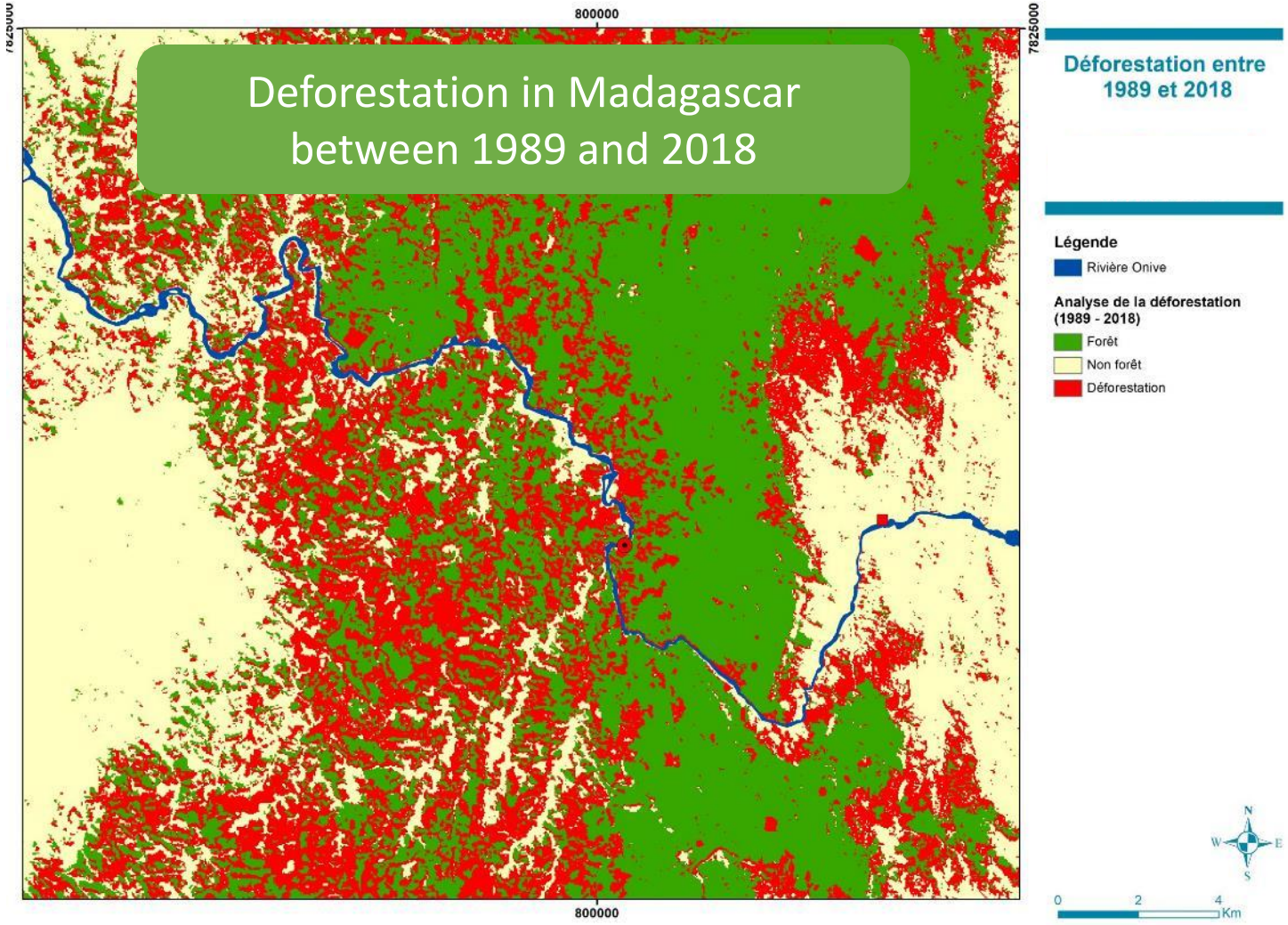
What are the current threats to biodiversity?

What are the known and on-going threats to biodiversity in the area?

- Deforestation
- Illegal hunting / logging
- …

This is important for cumulative impact analysis

Does the EIA include a map of threats / pressures on biodiversity?



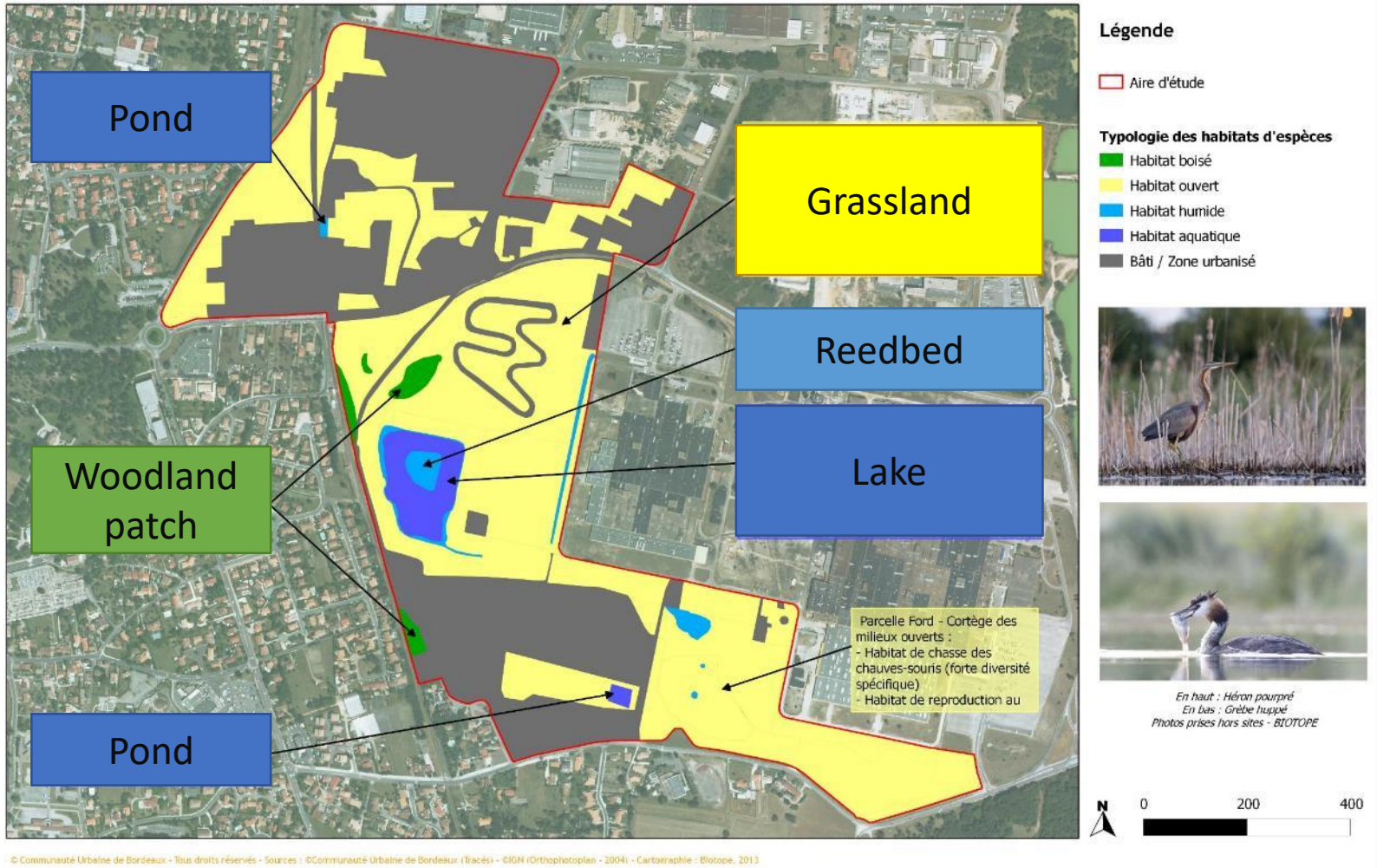
Deforestation in Madagascar between 1989 and 2018

Biodiversity also occurs in urban settings

Biodiversity isn't limited to protected areas!

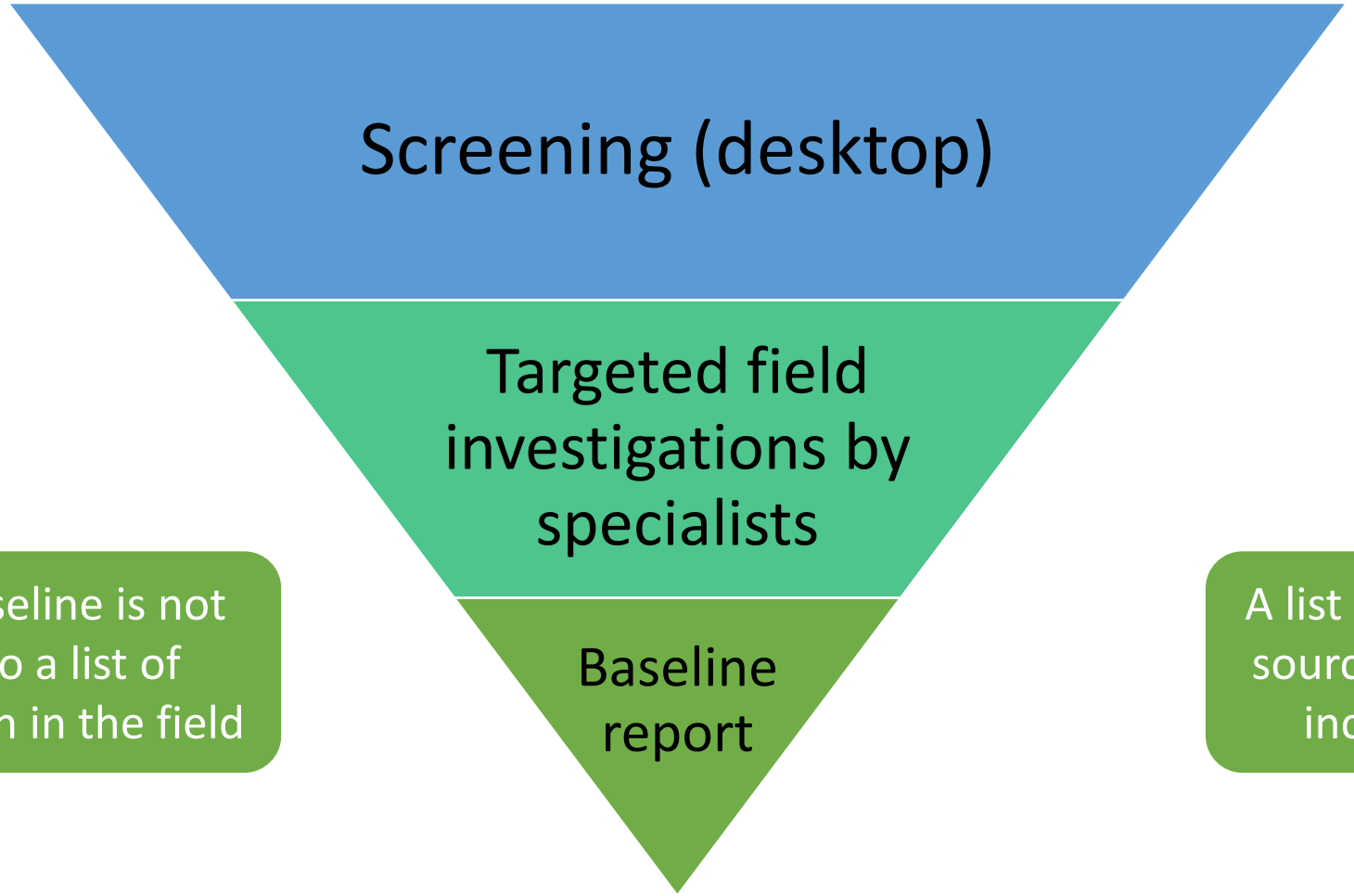
Biodiversity isn't limited to natural habitats!

Does the EIA consider where important biodiversity might occur?



Urban development in Bordeaux (France)

Baselines are not limited to field surveys



A good baseline is not limited to a list of species seen in the field

A list of publications and sources of data must be included in the EIA

Who did the work?

It is useful to provide:

- Role in preparing the EIA
- Name
- Qualifications
  - Diplomas
  - Membership of professional societies
  - Years of experience

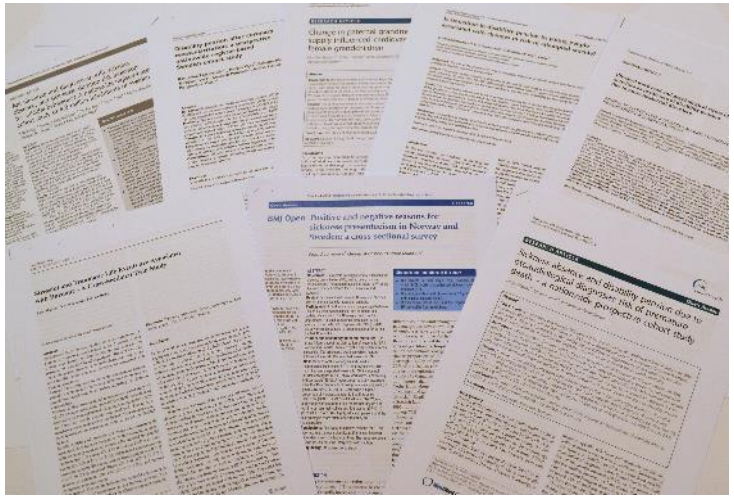
Role	Name	Qualification
Chef de projet Coordination et rédaction de l'étude	Gaëlle VIVES	Titulaire d'un Master II en expertises écologiques et gestion de la biodiversité Chef de projet ornithologue, 9 ans d'expérience dans le domaine
Botaniste et entomologue Expertise des habitats naturels, de la flore et des insectes	Thomas PICHILLOU	Titulaire d'un Master II professionnel en Forêt, Agronomie, Génie de l'Environnement, spécialité Conservation et Restauration des Ecosystèmes Botaniste et entomologue, 8 ans d'expérience dans le domaine
Fauniste Expertise des oiseaux, mammifères terrestres, amphibiens et reptiles	Lucien BASQUE	Titulaire d'une licence professionnelle « Suivi et diagnostic agri environnement ». Titulaire d'un BTS GPN option GEN Fauniste, 8 ans d'expérience dans le domaine.
Directeur d'étude spécialiste de l'éolien Suivi et contrôle Qualité	Florian LECORPS	Titulaire d'un Master 2 en gestion de l'environnement Directeur d'études, Ecologue et ornithologue, 11 ans d'expérience dans le domaine

Does the EIA provide the names of the key staff involved in preparing it?

Are they qualified?

What literature was consulted?

It is useful to provide a list of references / sources of information



Scientific publications

Does the EIA provide a list of referenced publications?

Are the references relevant to the site and project?

Technical reports

In what conditions was the work done?

Field work must be described:

- What?
- Where?
- When?
- How long?
- Who?

Does the EIA provide a detailed log of field surveys?

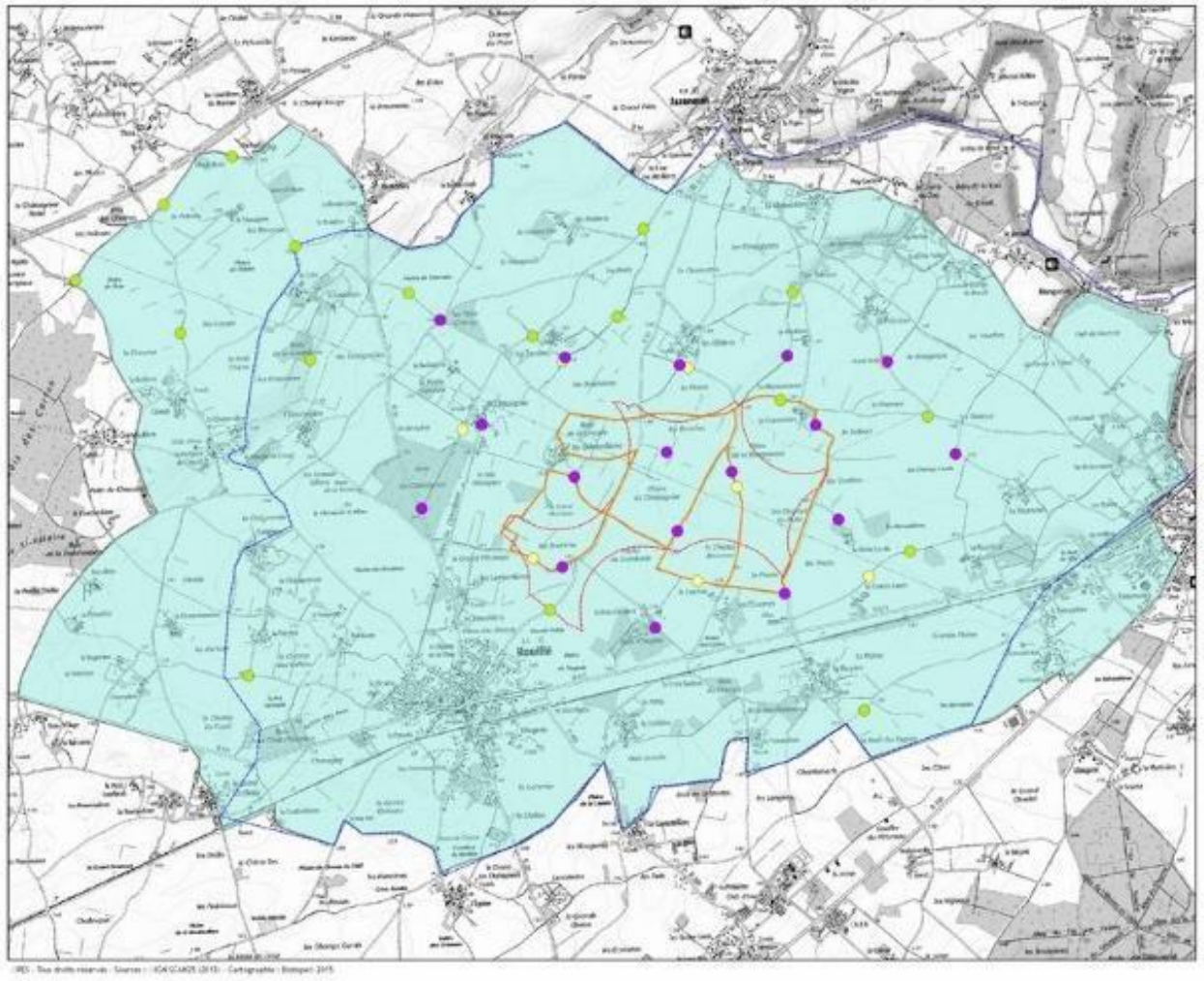
Important considerations include:

- Seasons
- Weather
- Water level
- *Anything that might influence the reliability of field data*

Does the EIA describe factors that may decrease the completeness or quality of the survey data?

Where were the surveys done?

Aire d'étude intermédiaire
Aire d'étude rapprochée
Points d'écoute
Bird surveys (fixed listening points)
Transects
Transects (car & foot)

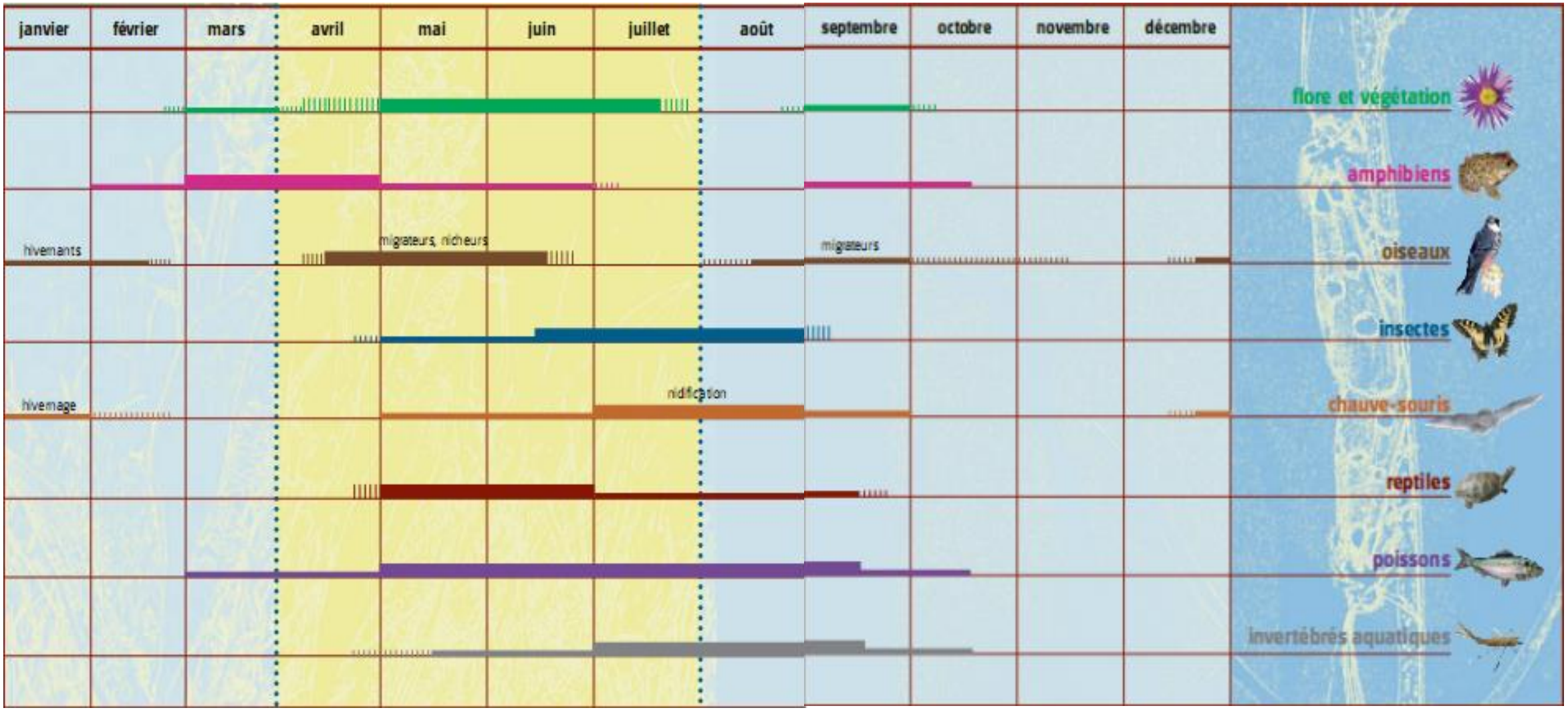


Wind power plant in France

Does the EIA include a map of where surveys took place?

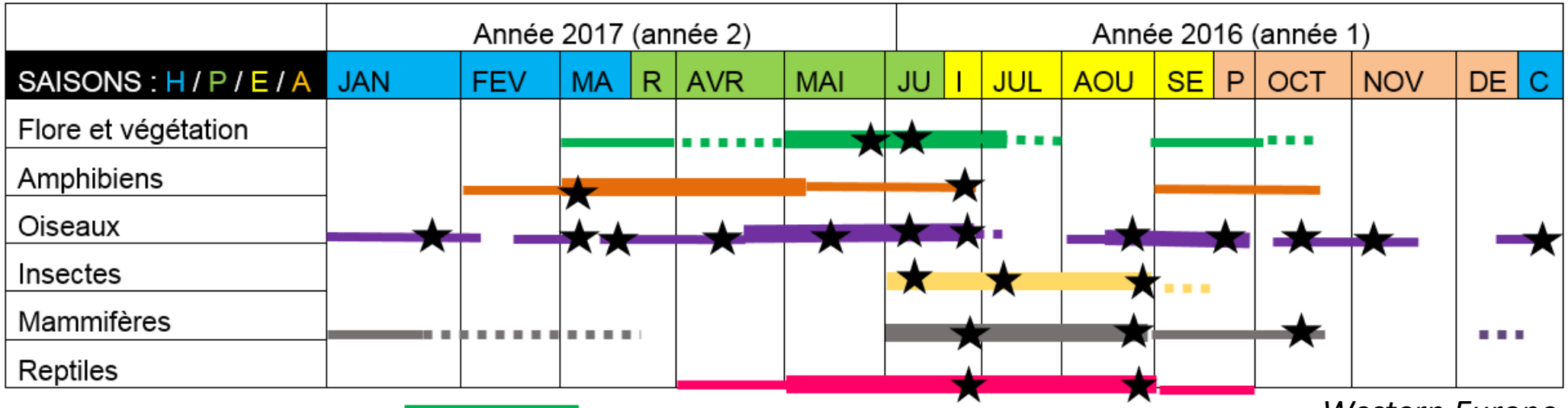
Do the surveys cover the study area? Are there any areas that may have been overlooked?

Seasons matter for ecological field surveys



Western Europe

Seasons matter for ecological field surveys



Western Europe

Best period

Possible period

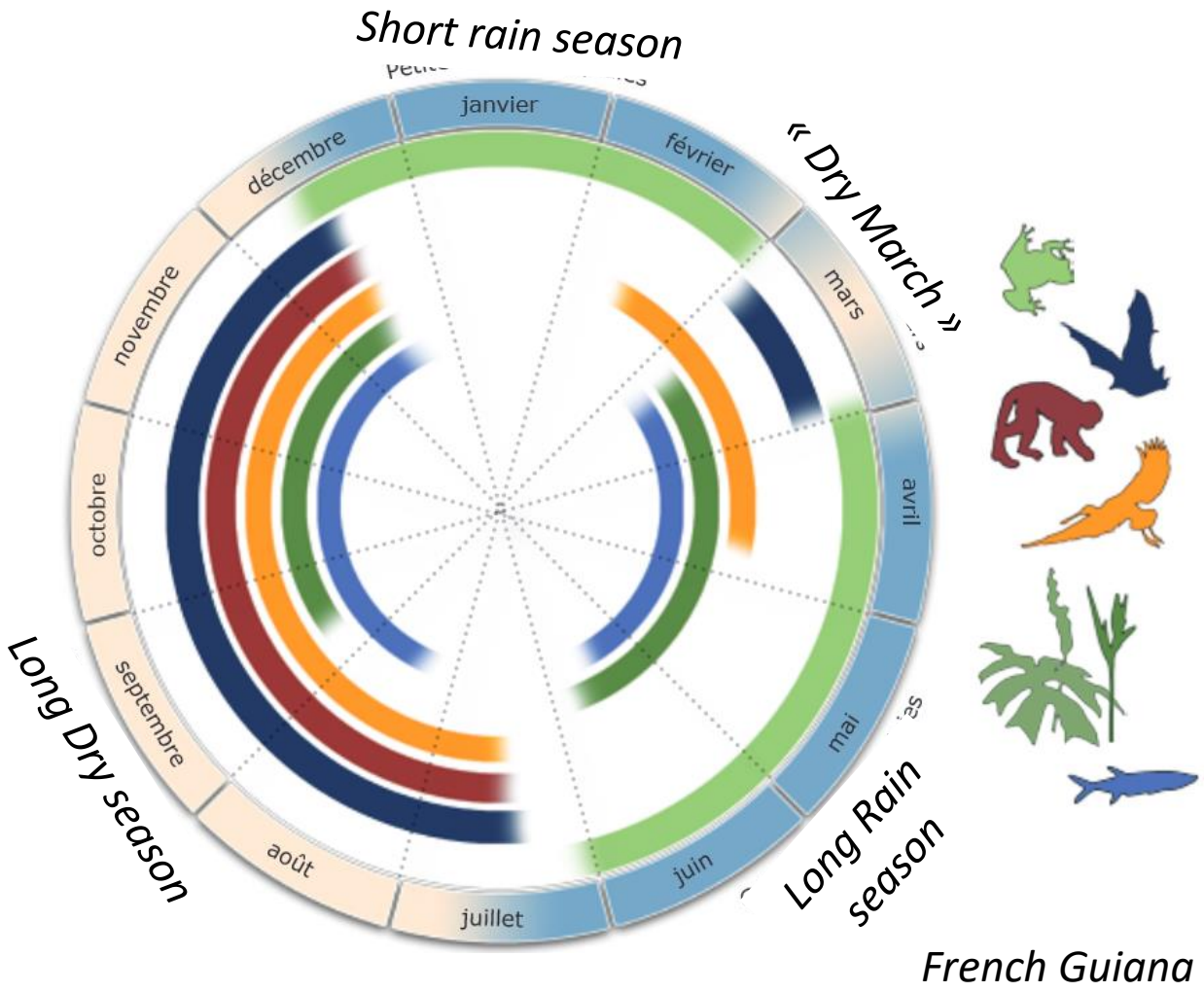
Accetable extensions

Field surveys!

Are the dates of field surveys appropriate given the seasons?

Discussion: which seasons for fieldwork?

	Wet season	Dry season
Flora		
Insects		
Fish		
Amphibians & reptiles		
Birds		
Mammals		



Results: which species are present?

Species lists are a key outcome of the desktop and field work:

- Vegetation types
- Flora
- Insects
- Molluscs
- Crustaceans
- Fish
- Amphibians
- Reptiles
- Birds
- Mammals

Does the EIA provide a list of species?

Are they provided in systematic order?

Does the EIA not cover some taxonomic groups?

For each species, the list must also include information on:

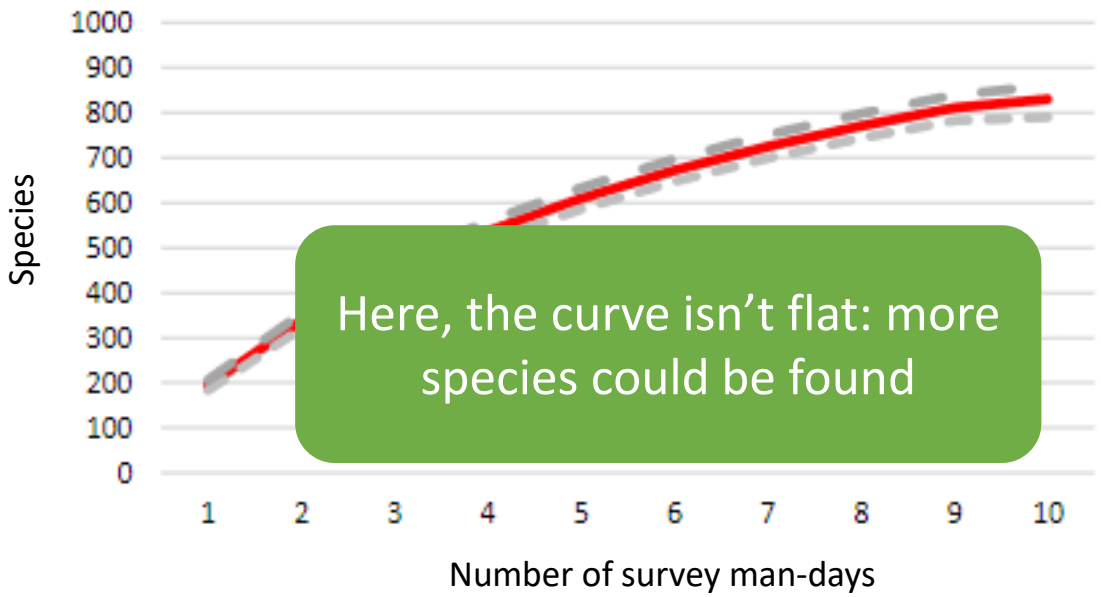
- Type of observation
- Habitat use
- National protection status
- National conservation status
- IUCN status
- …

What other information do you expect from an EIA?

How complete are the species lists?

- Accumulation curves are a good indicator of the level of effort
- As the level of effort increases, the number of new species detected must decrease
- The number of species can be compared to what was expected given:
  - Regional species list
  - Ecosytem species list
  - Other assessments in the same ecosystem

Does the EIA provide species accumulation curves?



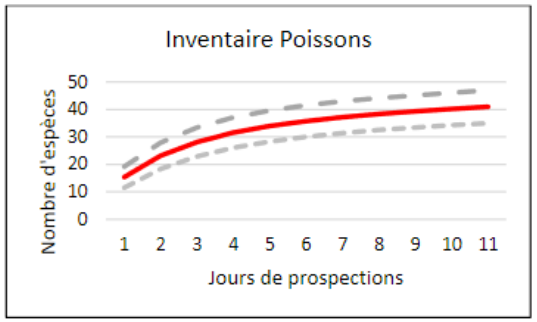
Here, the curve isn't flat: more species could be found

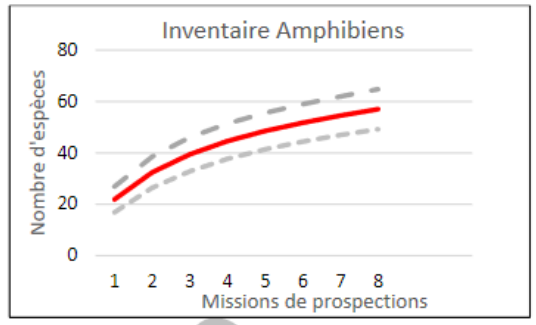
By comparing with relevant species lists, completeness was estimated at 70%

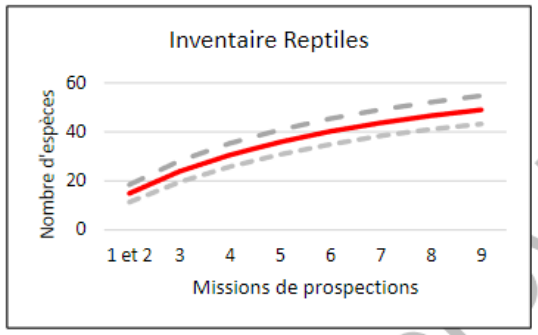
Gold mine in French Guiana

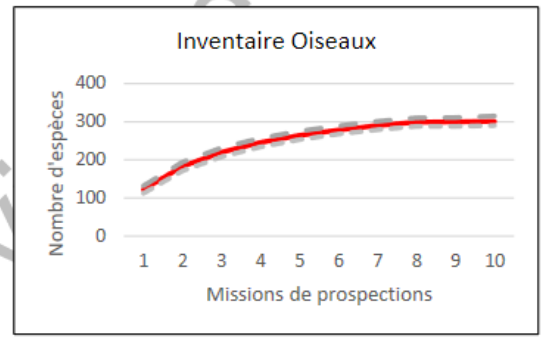
How complete are the species lists?

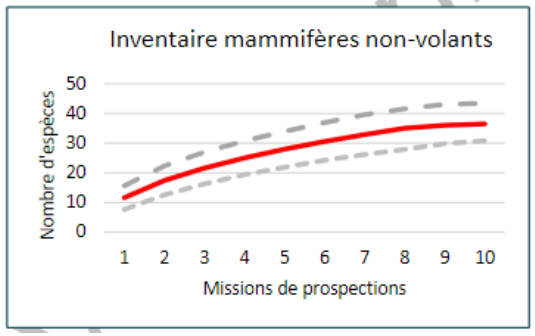
The same analysis can be conducted for all taxonomic groups

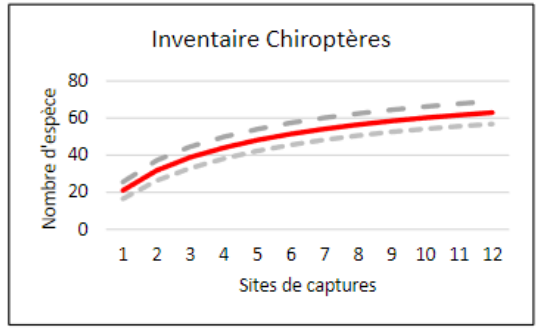












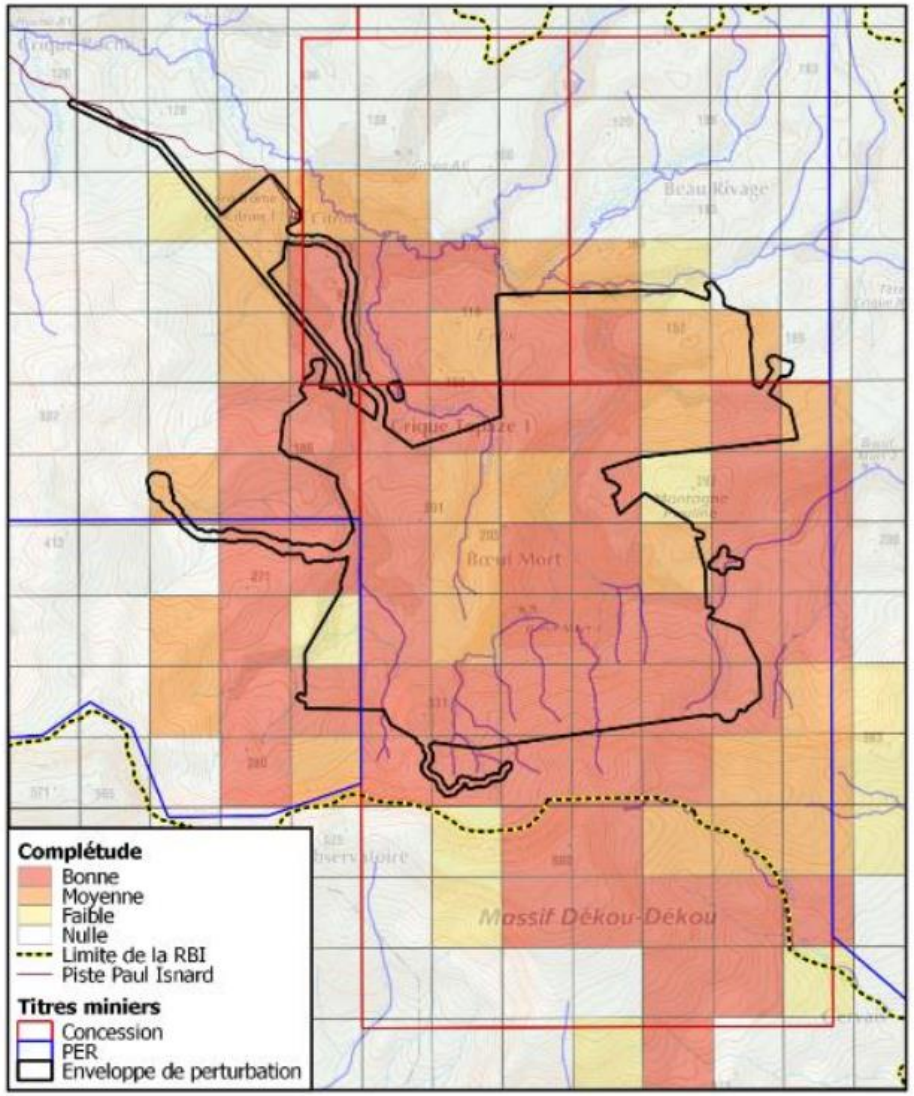
Gold mine in French Guiana

How complete is the baseline?

Completeness can be assessed by looking at:

- Location (where)
- Duration (how long)
- Timing (when)
- Protocol (how)
- Skills (people)

Does the EIA describe its completeness or limitations transparently?



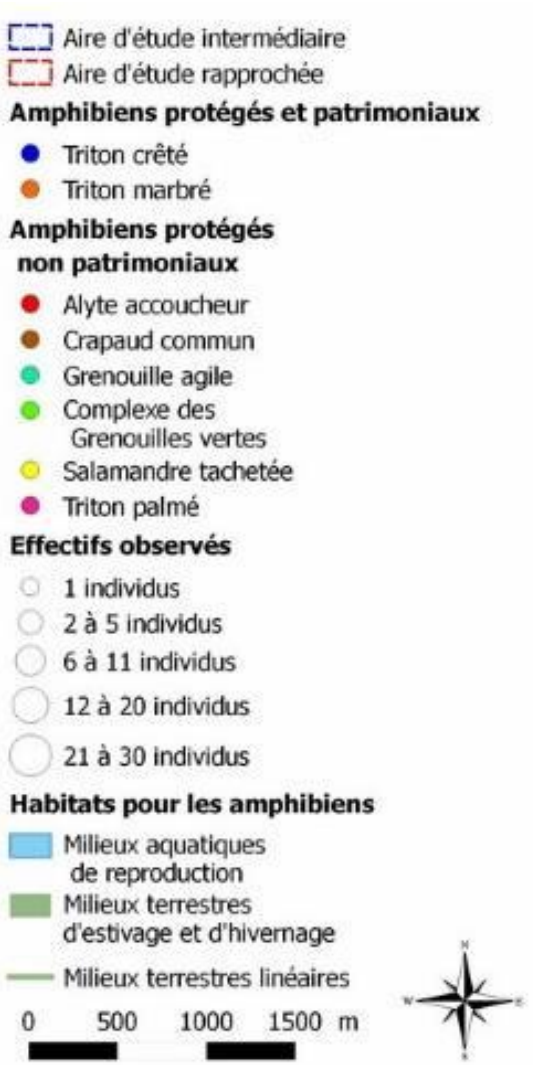
Gold mine in French Guiana

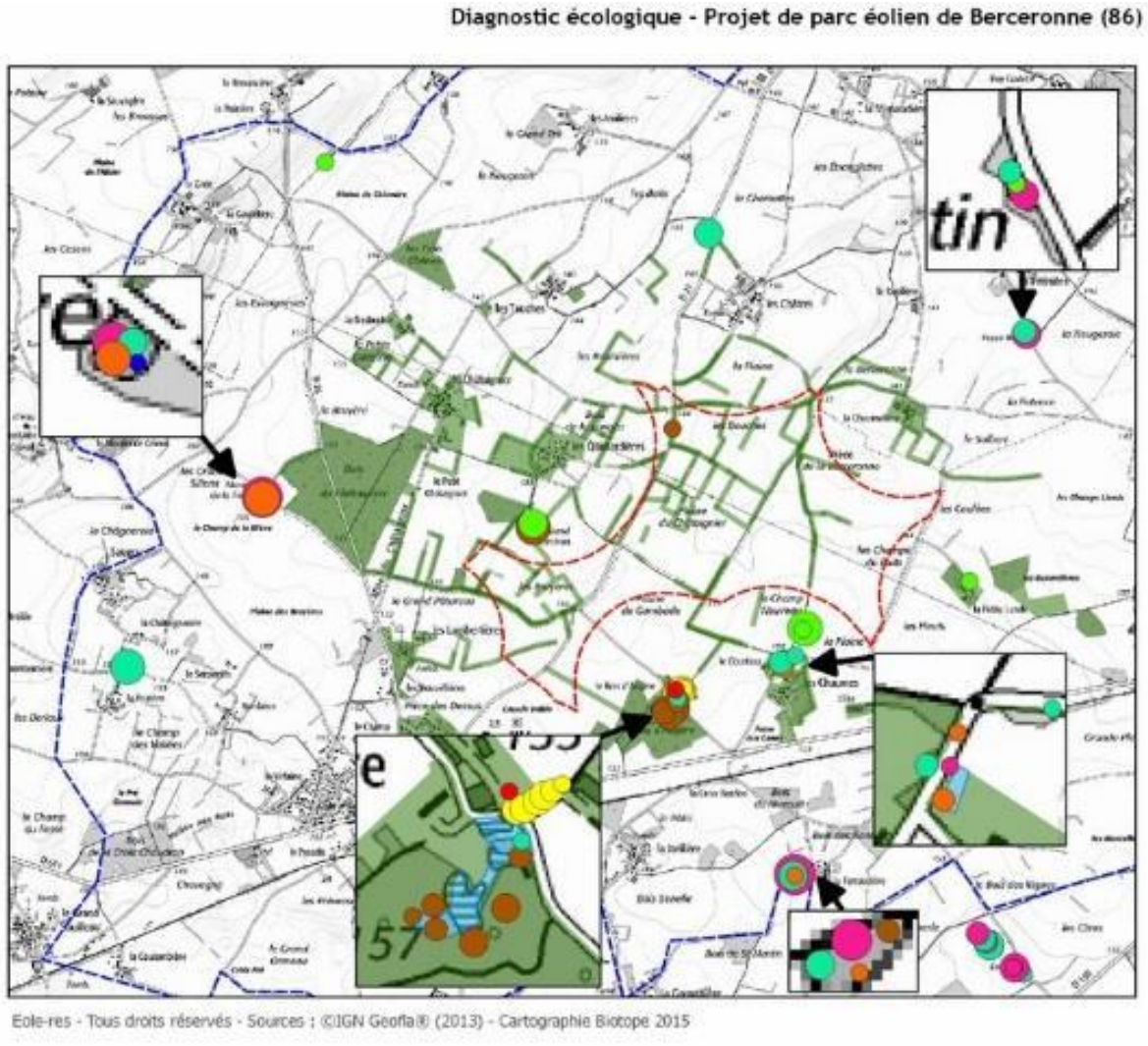
Where were species found?

Map of amphibian observations:

- Species
- Number of individuals
- Type of habitat: aquatic or terrestrial?

Does the EIA include maps of species observations?

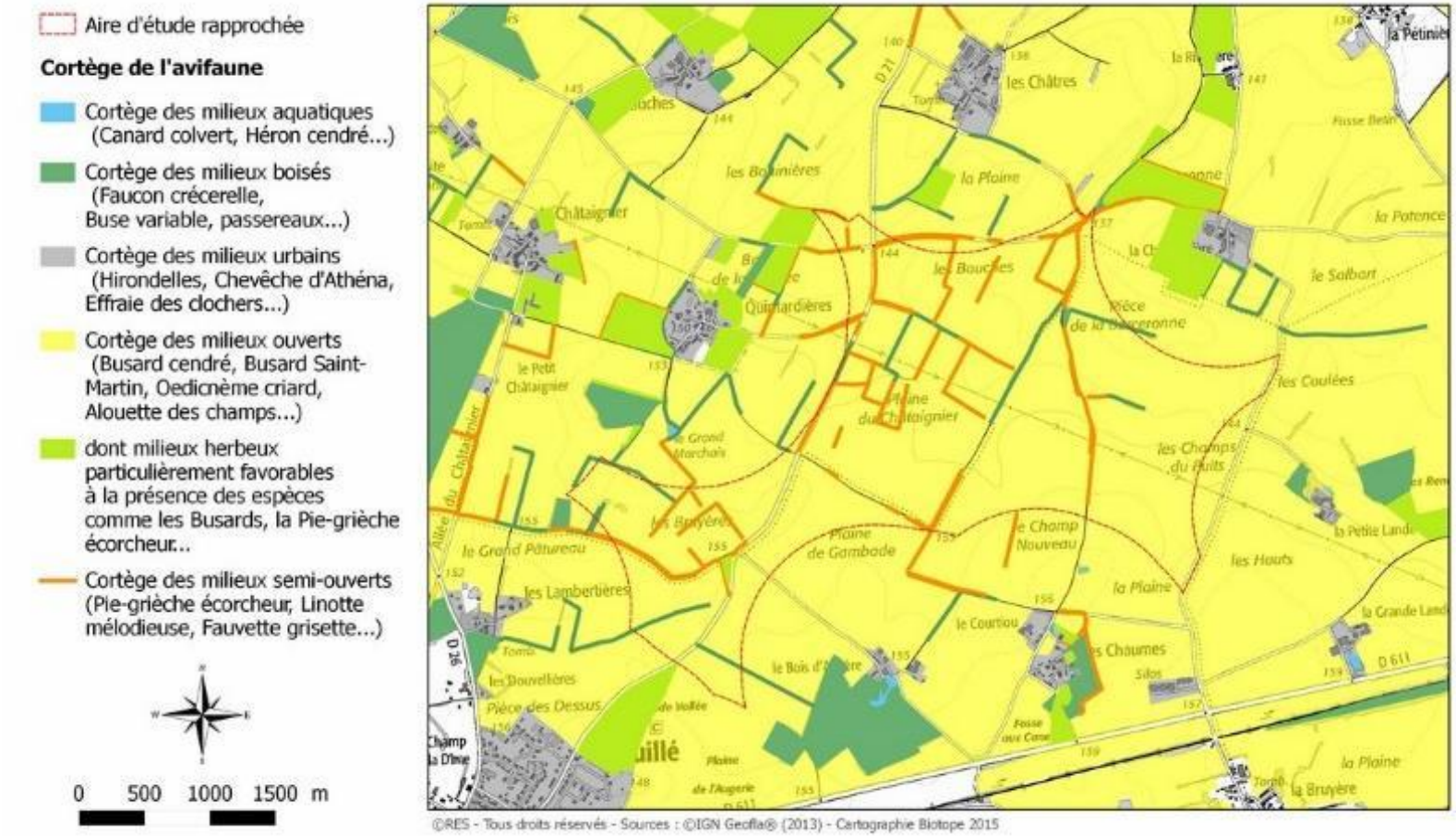




Which species are found in which habitats?

- Habitat used by species need to be identified and mapped
- Several species can share a habitat:
  - Forest species
  - Miombo species
  - Open grassland species
  - etc.

Does the EIA include a map of species habitats?

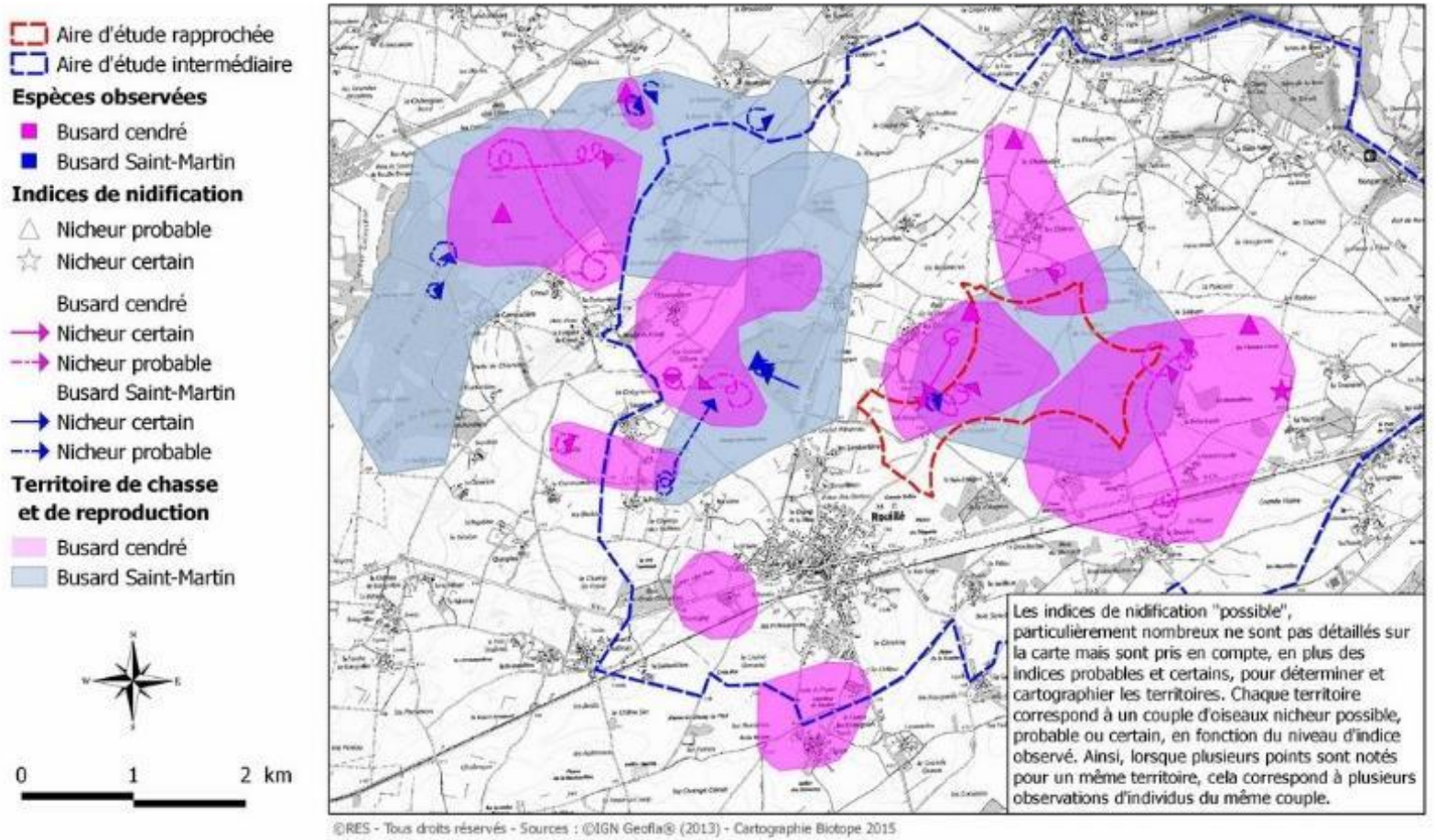


Wind power plant in France

How do species use habitats?

- Some species use different habitats for:
  - Breeding
  - Foraging
  - Wintering
  - …
- Some species are not tied to a particular type of vegetation
  - Large mammals
  - Birds of prey
  - …

Does the EIA identify the key features used by species?



Wind power plant in France

Which species or habitats are most important?

- Species and habitat features are ranked in terms of importance:
  - High concern
  - Medium
  - Low concern
  - Negligible concern
  - …
- The location of high-concern species and habitats can be mapped

Does the EIA explain how species and habitats were ranked in terms of importance?

What criteria were used?

What is the highest priority biodiversity?

Species

- Globally or nationally endangered species
  - Critically Endangered (CR)
  - Endangered (EN)
  - *Careful with Vulnerable (VU)*
- Restricted-range or endemic species
  - Area of occurrence < 50 000 Km2
  - Number of know localities < 100
- Concentrations of migratory and congregatory species

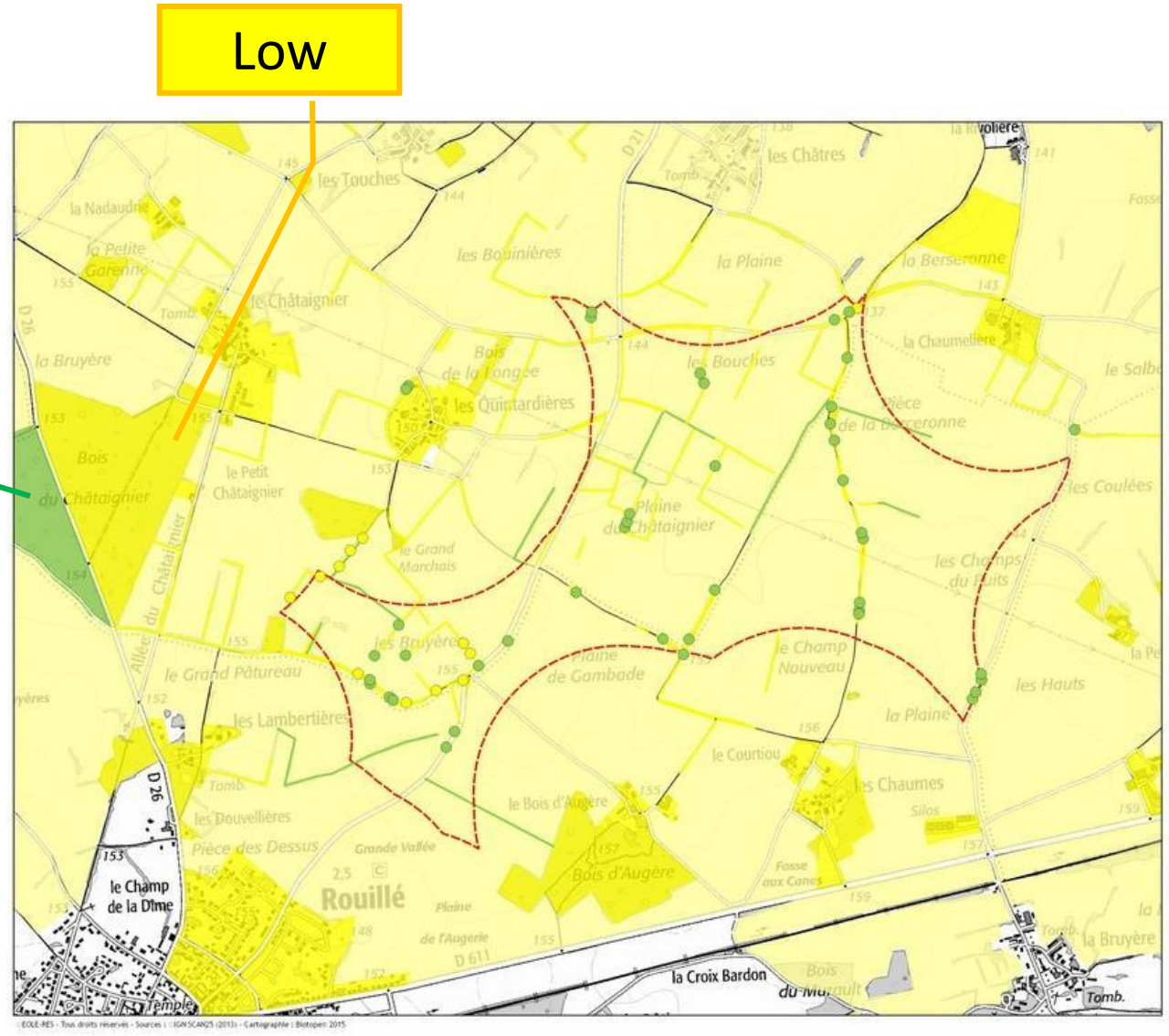
Ecosystems

- Highly-threatened & unique ecosystems
- Key evolutionary processes

Synthesis of biodiversity issues

- Species and habitat features are ranked in terms of importance:
  - High concern
  - Medium
  - Low concern
  - Negligible concern
  - …
- The location of high-concern species and habitats can be mapped

Does the EIA provide a map of the most sensitive sites (sensitivity map)?

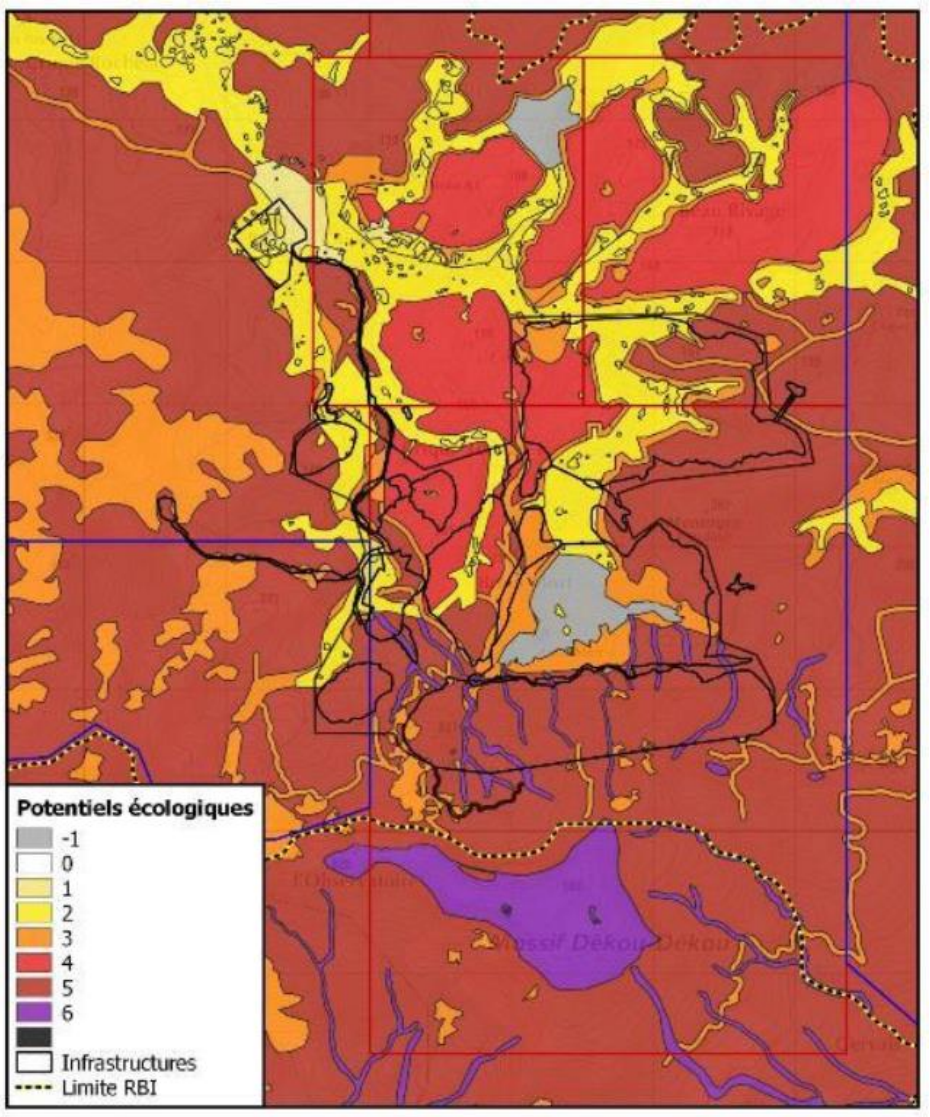


Wind power plant in France

Synthesis of biodiversity issues

Species and habitat features are ranked in terms of importance and mapped

Potentiels écologiques	Description	Habitats concernés avant impact
-1	Habitat d'origine anthropique très perturbé sans dynamique de régénération : absence de végétation et érosion très forte entraînant des pollutions par matières en suspension (MES).	- Terrain vagues
0	Habitat artificialisé occupé par des installations industrielles	- Aucun
1	Habitat d'origine anthropique occupé par une végétation cultivée (verger) ou pionnière et entretenue mécaniquement.	- Zones rudérales
2	Habitats d'origine anthropique occupés par une mosaïque de végétations pionnières denses et d'habitats aquatiques artificiels accueillant parfois quelques espèces écologiquement adaptées ou protégées	- Friches et brousses - Eaux douces dormantes - Clairières lianescentes hydromorphes
3	Habitats naturels forestiers ayant subi des dégradations structurelles importantes et anthropiques (exploitation de bois, pistes forestières, défrichements) ou non (glissement de terrain), mais abritant de nombreuses espèces spécialisées et/ou protégées	- Cambrouses - Forêts secondaires
4	Habitats naturels forestiers matures ayant subi des dégradations localisées, mais conservant une grande partie des éléments caractéristiques d'une forêt primaire (structuration, cortège floristique et faunistique)	- Forêts matures perturbées
5	Habitats naturels forestiers matures non perturbés et abritant une biodiversité floristique et faunistique exceptionnelle à l'échelle mondiale	- Forêts matures à caractère primaire
6	Habitats naturels primaires localisés et de faible étendue, originaux de par leur singularité fonctionnelle ou leurs conditions abiotiques particulières et accueillant des espèces rares à l'échelle mondiale, protégées, écologiquement spécialisées.	- Forêts des torrents et des vallons encaissés - Forêts sommitales de moyenne altitude - Forêts marécageuses de moyenne altitude - Parois rocheuses - Mares forestières



Gold mine in French Guiana

Assessing projects' impacts on biodiversity

The project: why, what, where, how and when?

Some key information

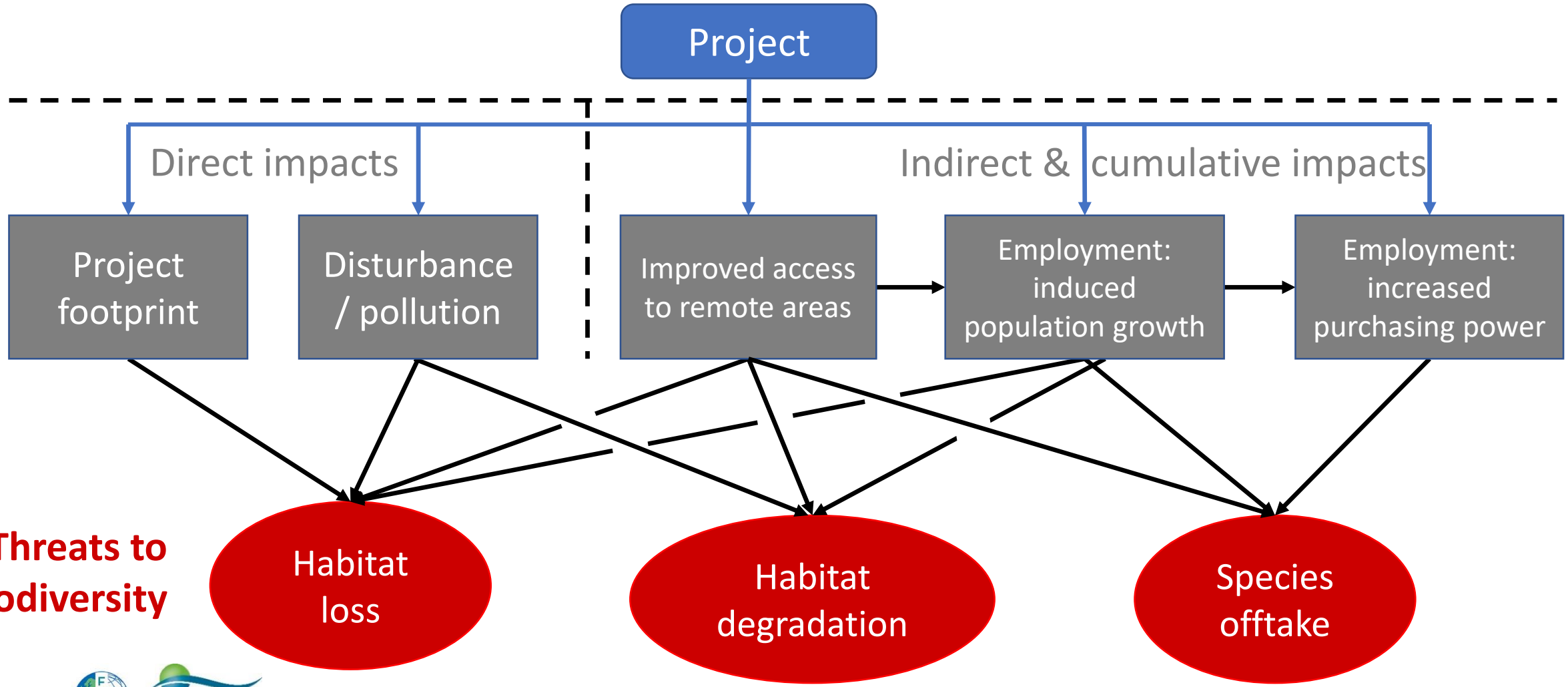
- Justification
- Location
- Design
- Associated facilities
- Timeline (construction& operations)
- Alternatives!

Does the EIA include enough information on the project?

Does the EIA include an alternatives analysis?

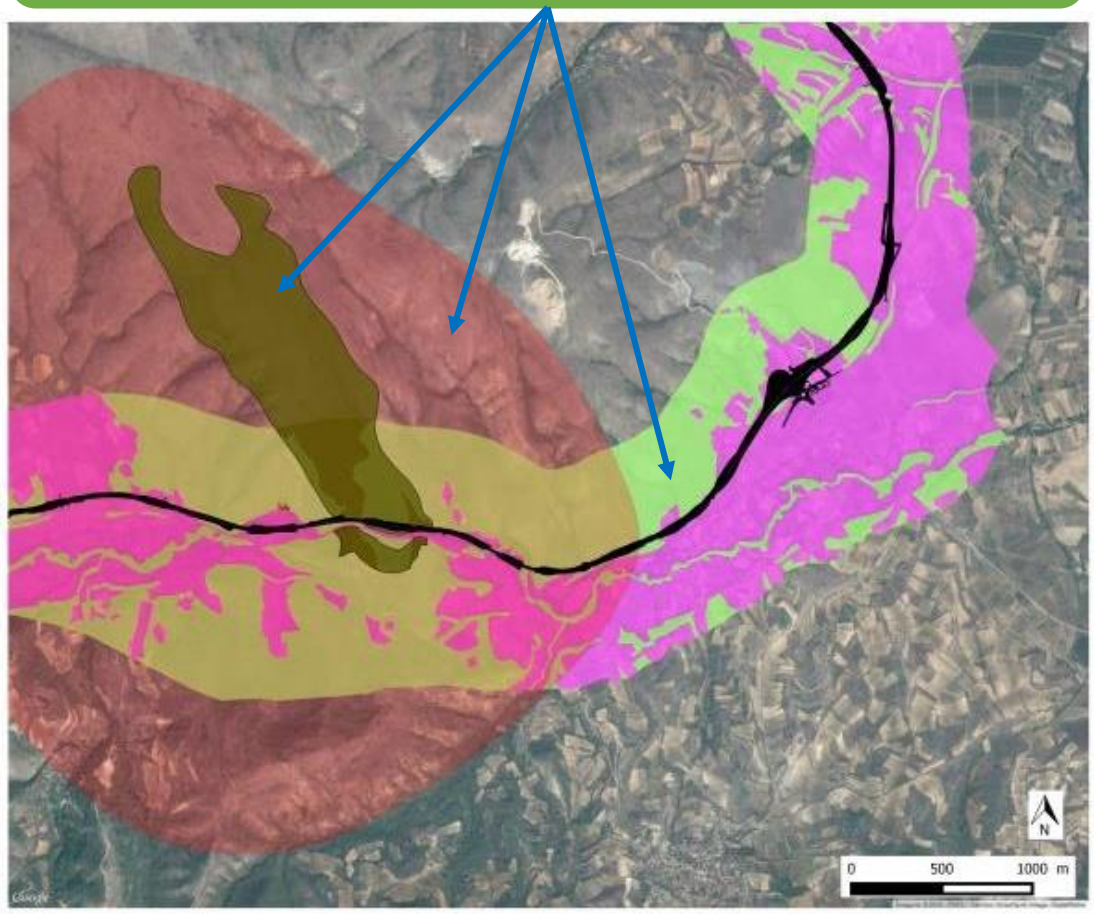
Offshore road in Réunion island

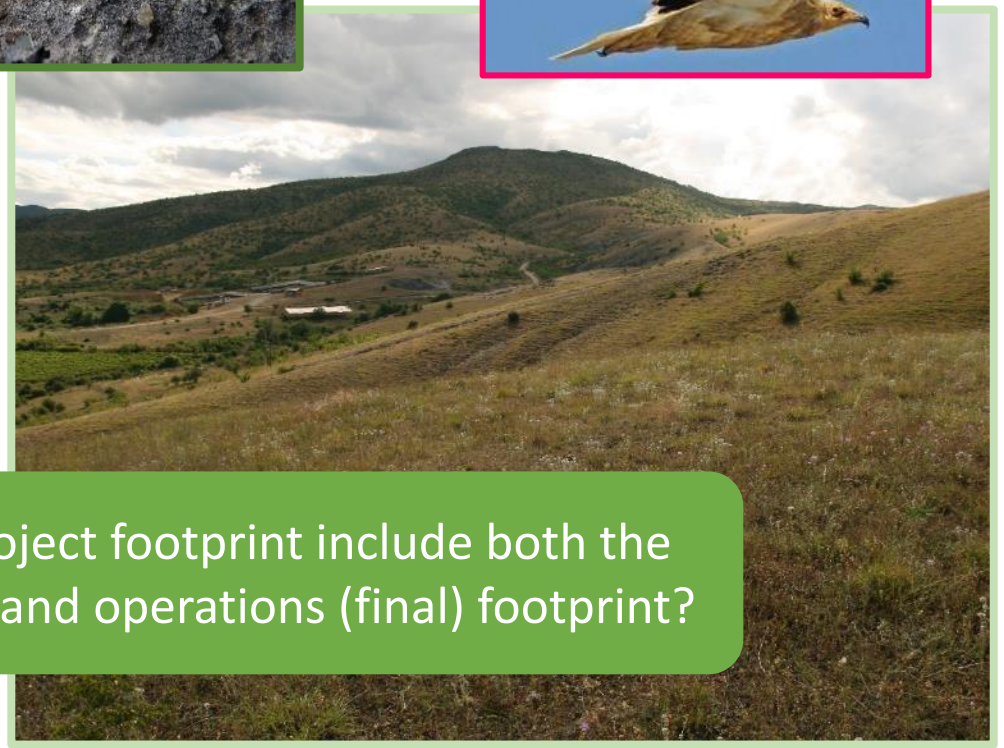
What are impacts on biodiversity?



Where is the project footprint?

Does the EIA include a map that overlays the project footprint with the sensitivity map?





Does the project footprint include both the construction and operations (final) footprint?

Road in Macedonia

Are there impacts beyond the footprint?

Project impacts on the water cycle (flooding, drainage, loss of connectivity) can be important and distant from the project itself, and affect terrestrial and aquatic habitats

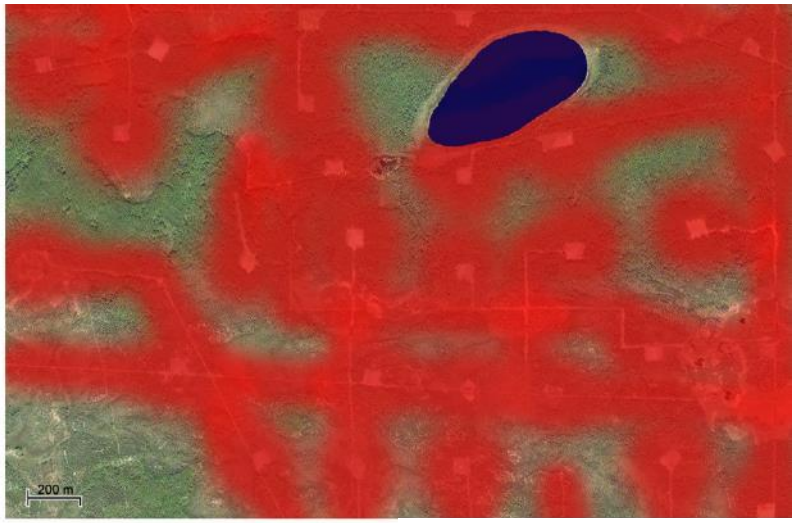
Road in Gabon

Are there impacts beyond the footprint?

Woodland caribou habitat may appear to be only marginally affected by oil pads and small access roads… but they avoid large areas in a buffer around roads : a much larger area is effectively lost.

An area with multiple projects can lead to the complete extirpation of a species such as woodland caribou.

Species respond differently to changes in their environment, and some are particularly sensitive to disturbance (e.g. noise, sound, smell … or human presence)



Source: Raiter et al. 2014

Oil & Gas in Canada

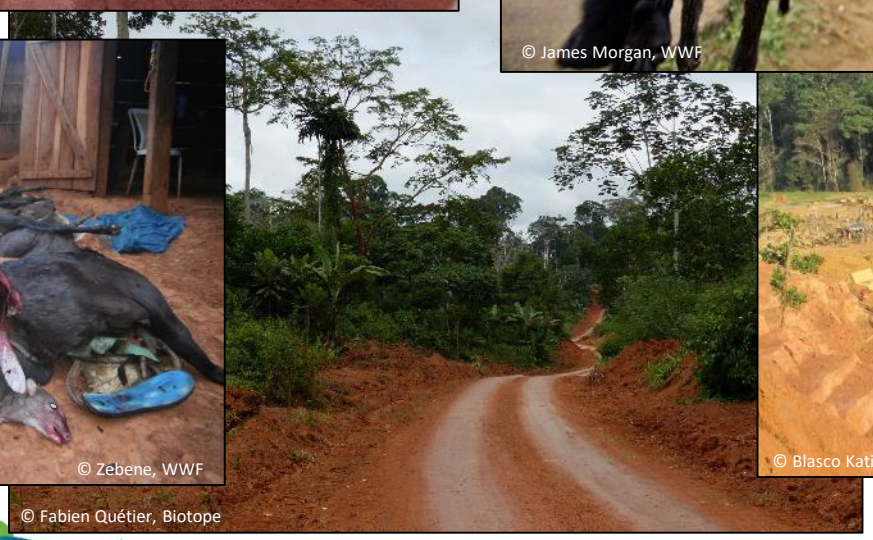
Remote areas: induced access is the biggest impact!


© Fabien Quétier, Biotope


© James Morgan, WWF


© James Morgan, WWF


© Zebene, WWF


© Fabien Quétier, Biotope


© Blasco Katie, WWF


© James Morgan, WWF

What is the difference between an impact and a risk?

Does the EIA consider possible and even unlikely impacts such as accidental pollution events?

- Certain impact: Very likely to occur
- Likely impact: Will probably occur
- Possible impact: May occur
- Unlikely impact: Not expected to occur

Assessing projects' impacts on biodiversity: different kinds of projects

What are the impacts of a road project?

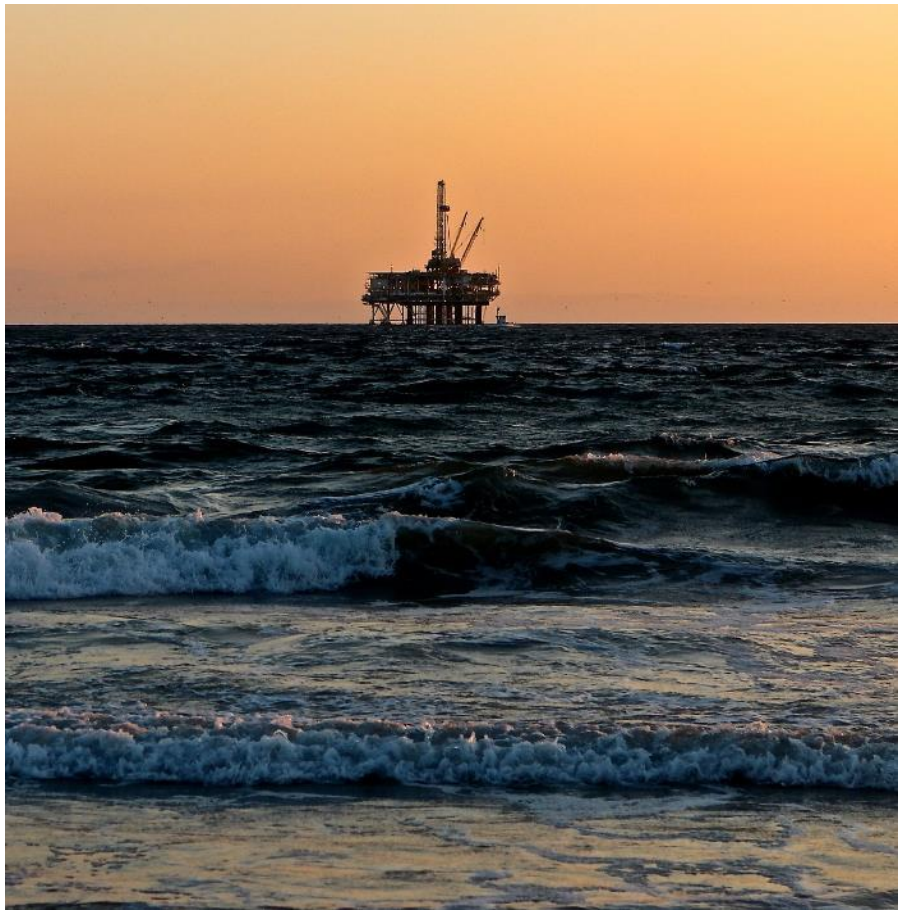
Construction

- Construction footprint > operations footprint
- Quarries
- Fragmentation of natural habitat (incl. Aquatic)
- Erosion
- Pollution from construction and operation
- Changes to local hydrology / soils

Operation

- Disturbance buffer (noise etc.)
- Collision mortality
- Induced access & Settlement

What are the impacts of an offshore oil & gas project?



Construction

- Pollution and noise from exploration
- Pollution and noise from marine transport
- Pipe and platform footprints
- + coastal infrastructure

Operation

- Pollution and noise from marine transport
- Light pollution (sea-birds)
- Pollution (waste management) + spill risk

What are the impacts of a wind-power project?

Construction

- Mast and access road footprints > construction footprint
- Footprint of powerline construction
- + road impacts

Operation

- Disturbance buffer (avoidance area)
- Collision mortality (bats, birds…)
- Vegetation management (right of way)
- + powerline impacts

What are the impacts of a hydropower project?

Construction

- Reservoir footprint & mortality during flooding
- Footprint of associated infrastructure (roads + powerlines)
- Erosion & pollution (water quality)
- Fragmentation (obstacle to fish movement)

Operation

- Change to downstream hydrological regime
- Surge effects downstream
- Change to water quality (stagnant water in the reservoir)
- + road and powerline impacts

What are the impacts of a mine project?

Construction

- Footprint, pollution and noise from exploration
- Footprint of mine & associated facilities (processing plants, roads, etc.)
- Erosion & pollution (water, dust, noise..)
- Fragmentation

Operation

- Disturbance buffer (noise, dust, etc.)
- Chronic pollution (chemical deposition)
- Pollution risk (tailings etc.)
- + road and other infrastructure impacts

What are the impacts of a tourist lodge?

Construction

- Footprint
- Pollution (materials, workers,…)
- + impact of road and utilities (power, water, etc.)

Operation

- Chronic pollution (waste management)
- Disturbance from extra tourists
- + road and other infrastructure impacts

What are the impacts of an agriculture or forestry project?

Construction

- Clearing native vegetation on a large area
- Introduction of non-native species

Operation

- Disturbance buffer (noise, dust, etc.)
- Chronic pollution (pesticides, fertilizer)
- Increased human population (+ social changes affecting hunting / eating habits…)
- + road and other infrastructure impacts

What are the impacts of an urban development project?

Construction

- Footprint
- Pollution (materials, workers,…)
- + impact of road and utilities (power, water, etc.)

Operation

- Chronic pollution (waste management)
- Increased human population (+ social changes affecting hunting / eating habits…)
- + road and other infrastructure impacts

Assessing projects' impacts on biodiversity: presenting outcomes

How are impacts presented?

- Magnitude of impact
  - Extent
  - Duration
  - Intensity
- Sensitivity of the receptor biodiversity
  - Behavioural response
  - Resilience
- Significance of the impact

Likelihood ≠ Magnitude

Sensitivity ≠ Conservation status

The impact assessment matrix

Magnitude of impact	Sensitivity of the receptor biodiversity: Very low	Low	Medium	High	Very high
Very low	Negligible	Negligible	Minor	Minor	Moderate
Low	Negligible	Minor	Minor	Moderate	Major
Medium	Minor	Minor	Moderate	Major	Major
High	Minor	Moderate	Major	Major	?
Very high	Moderate	Major	Major	?	?

Impact assessment

Will EIAs deliver NNL of Net Gain of Biodiversity?

Can’t EIA take care of biodiversity?

- EIA rarely planned to achieve NNL/NG.
- Typically only requires avoidance, minimisation for some impacts.
- Usually does not address residual impacts.
- Does not address all components of biodiversity affected.
- Often very site specific, without proper landscape scale.
- Often fails to address indirect and cumulative impacts.

HOWEVER mitigation including offsets can be integrated with the EIA process to deliver ‘no net loss’!



If not EIA, then what is the trigger?

- Planning law and policy (ie permits for construction)
- Sectoral law and policy (eg mining, oil and gas, fisheries, agriculture, hydropower, etc)
- Environment/Conservation law (eg Clean Water Act for wetlands and Endangered Species Act for species in the USA)
- Strategic Environmental Assessment

EIAs: Challenges

- Typical reference EIAs help, but do not go far enough to plan No Net Loss and design mitigation measures, including offsetting.

- What additional information is needed to enable EIAs to contribute to No Net Loss planning?

- Scope (ecological)
- Scope (geographical)
- Nature of data (both quantitative and qualitative)

EIAs: Challenges

Project life cycle, ecological deadlines and financial life cycle are not always aligned.

How to manage this?

- Review of reference EIA ToRs and integrate offset data requirements.
- If necessary, after the EIA, you can order additional reference work.
- Be ready! Financing by banks sometimes requires very fast work.
- Standard Terms of Reference?
- Knowledge of existing data sets and experts?

Managing impacts:
Following the mitigation hierarchy

Impact assessment: following the mitigation hierarchy

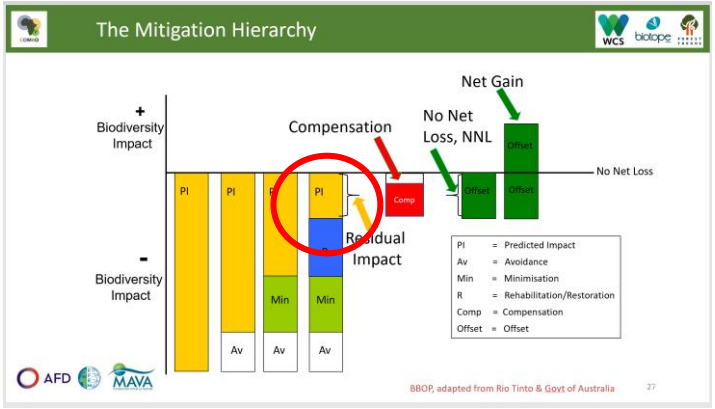
⇒ **See the module on the Mitigation Hierarchy**

⇒ **This section only reviews whether EIAs present residual impacts and offsets properly**

Residual Impacts

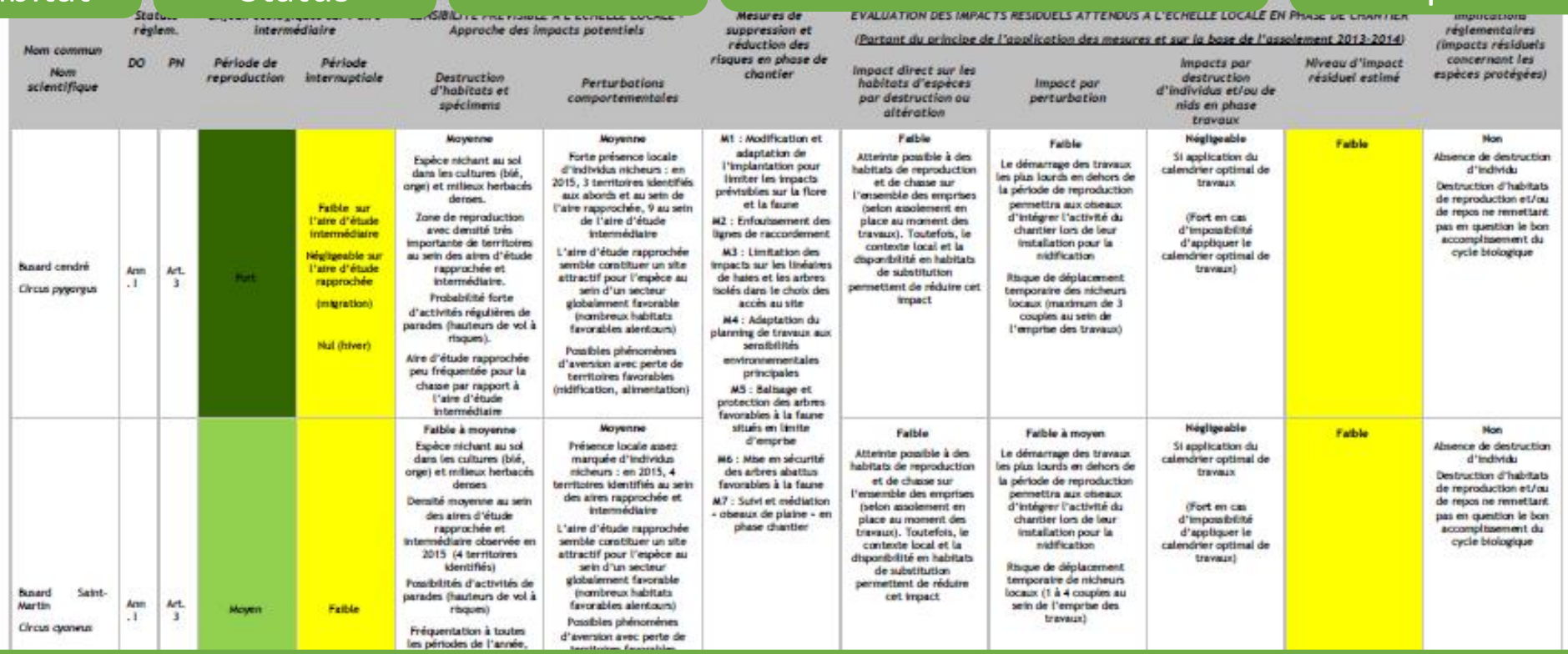
Residual impacts are the impacts that remain **AFTER** avoidance, minimisation, rehabilitation/restoration activities have been implemented. The objective of the offset or compensation is to address the residual impacts.

Avoid → Minimise → Rehabilitate/Restore → Offset Residual Impacts



How are impacts and mitigation presented?

Species / Habitat | Conservation Status | Sensitivity | Avoidance & Minimization | Residual Impacts



Nom commun / Nom scientifique	Statut réglem. DO	Statut réglem. PN	Période de reproduction	Période interruptiale	Destruction d'habitats et spécimens	Perturbations comportementales	Mesures de suppression et réduction des risques en phase de chantier	Impact direct sur les habitats d'espèces par destruction ou altération	Impact par perturbation	Impacts par destruction d'individus et/ou de nids en phase travaux	Niveau d'impact résiduel estimé	Implications réglementaires (impacts résiduels concernant les espèces protégées)
					Approche des impacts potentiels			(Partant du principe de l'application des mesures et sur la base de l'assolement 2013-2014)				
Busard cendré Circus pygargus	Ann. I	Art. 3	Fort	Faible sur l'aire d'étude intermédiaire Négligeable sur l'aire d'étude rapprochée (migration) Nul (hiver)	Moyenne Espèce nichant au sol dans les cultures (blé, orge) et milieux herbacés denses. Zone de reproduction avec densité très importante de territoires au sein des aires d'étude rapprochée et intermédiaire. Probabilité forte d'activités régulières de parades (hauteurs de vol à risques). Aire d'étude rapprochée peu fréquentée pour la chasse par rapport à l'aire d'étude intermédiaire	Moyenne Forte présence locale d'individus nicheurs : en 2015, 3 territoires identifiés aux abords et au sein de l'aire rapprochée, 9 au sein de l'aire d'étude intermédiaire L'aire d'étude rapprochée semble constituer un site attractif pour l'espèce au sein d'un secteur globalement favorable (nombreux habitats favorables alentours) Possibles phénomènes d'aversion avec perte de territoires favorables (nidification, alimentation)	M1 : Modification et adaptation de l'implantation pour limiter les impacts prévisibles sur la flore et la faune M2 : Enfouissement des lignes de raccordement M3 : Limitation des impacts sur les linéaires de haies et les arbres isolés dans le choix des accès au site M4 : Adaptation du planning de travaux aux sensibilités environnementales principales M5 : Balisage et protection des arbres favorables à la faune situés en limite d'emprise M6 : Mise en sécurité des arbres abattus favorables à la faune M7 : Suivi et médiation « oiseaux de plaine » en phase chantier	Faible Atteinte possible à des habitats de reproduction et de chasse sur l'ensemble des emprises (selon assolement en place au moment des travaux). Toutefois, le contexte local et la disponibilité en habitats de substitution permettent de réduire cet impact	Faible Le démarrage des travaux les plus lourds en dehors de la période de reproduction permettra aux oiseaux d'intégrer l'activité du chantier lors de leur installation pour la nidification Risque de déplacement temporaire des nicheurs locaux (maximum de 3 couples au sein de l'emprise des travaux)	Négligeable Si application du calendrier optimal de travaux (Fort en cas d'impossibilité d'appliquer le calendrier optimal de travaux)	Faible	Non Absence de destruction d'individu Destruction d'habitats de reproduction et/ou de repos ne remettant pas en question le bon accomplissement du cycle biologique
Busard Saint-Martin Circus cyaneus	Ann. I	Art. 3	Moyen	Faible	Faible à moyenne Espèce nichant au sol dans les cultures (blé, orge) et milieux herbacés denses Densité moyenne au sein des aires d'étude rapprochée et intermédiaire observée en 2015 (4 territoires identifiés) Possibilités d'activités de parades (hauteurs de vol à risques) Fréquentation à toutes les périodes de l'année,	Moyenne Présence locale assez marquée d'individus nicheurs : en 2015, 4 territoires identifiés au sein des aires rapprochée et intermédiaire L'aire d'étude rapprochée semble constituer un site attractif pour l'espèce au sein d'un secteur globalement favorable (nombreux habitats favorables alentours) Possibles phénomènes d'aversion avec perte de		Faible Atteinte possible à des habitats de reproduction et de chasse sur l'ensemble des emprises (selon assolement en place au moment des travaux). Toutefois, le contexte local et la disponibilité en habitats de substitution permettent de réduire cet impact	Faible à moyen Le démarrage des travaux les plus lourds en dehors de la période de reproduction permettra aux oiseaux d'intégrer l'activité du chantier lors de leur installation pour la nidification Risque de déplacement temporaire de nicheurs locaux (1 à 4 couples au sein de l'emprise des travaux)	Négligeable Si application du calendrier optimal de travaux (Fort en cas d'impossibilité d'appliquer le calendrier optimal de travaux)	Faible	Non Absence de destruction d'individu Destruction d'habitats de reproduction et/ou de repos ne remettant pas en question le bon accomplissement du cycle biologique

Does the EIA provide a table that links biodiversity features, their importance, their sensitivity, mitigation measures to residual impacts?

Can residual impacts be offset?

Habitat	Key facts and risks	Dedicated Mitigation measures (BMP)	Residual impact taking into account the BMP
Cliffs and rocky slopes (chasmophytic vegetation), including a large bat roost Project construction area includes this CRITICAL HABITAT	Rocky habitats found in Drenovo gorge, with 8 ha in a ca. 1000 m wide strip centred on the axis of the planned road, are rare in the wider region. It harbours a range of chasmophytic species of conservation significance, high densities of the single-site endemic *Carinigera drenovoensis*, and breeding sites for the endangered Egyptian vulture (see above). Direct destruction by the project: 1.3 ha in a 100 m wide strip (16% of the extent of the habitat in a 1 km wide strip), and 0.4 ha under final project footprint. The habitat could also be degraded by dust deposits during construction and the spread of *Ailanthus altissima* by machinery and materials. A cave, situated ca. 80 m above the bottom of the cliff and the northern limit of the road project, above the river, is used as a breeding and wintering roost by several bat species. Risks to the roost included disturbance during construction, and increased mortality from collisions. In particular, Bats feed in the riparian forest and could suffer increased mortality from collisions with traffic in going back and forth between the cave and the river.	Dust deposits will be minimised through dry and/or windy weather (MIT04). This and the first year of operation. Impacts on the local snail population w years), to ensure that its viability has not The capacity of the bats to move between the river valley will be maintained by inst Raeo river that separates the cave from t	
Petrifying spring complex (including associated aquatic vegetation and humid grasslands) Project construction area includes this CRITICAL HABITAT	The petrifying spring located at the north-western entrance of the Drenovo gorge, alongside and on a local pathway, is a priority habitat (7220*) in Annex I of the Habitats Directive. The habitat is not directly impacted by the road project, but could suffer from increased visits and trampling by people and vehicles. It is protected from air pollution by the riparian forest along the Raeo river.	The planned road will not directly in fenced off to people and vehicles d	
Other natural habitats			
River, and riparian forest, forming a natural corridor for wildlife Project construction area includes this NATURAL HABITAT	The road project follows the Raeo river valley and 10 crossings are planned. It is unknown if the restricted range Pelagonia trout (*Salmo pelagonicus*) is present in the river. The riparian forest is present alongside a large western part of the road project in the study area and particularly in the Drenovo gorge. It is degraded by stands of Locust trees (*Robinia pseudoacacia*) and fragmented by the existing road. Direct destruction by the project could reach ca. 9 ha in a 100 m wide strip (19% of the extent of the habitat in a ca. 1 km wide strip), 1.3 ha under the final project's footprint. The river bed could be impacted by the construction of 10 bridges, a bridge-like structure on piles (in Drenovo Gorge) and by embankments. These structures could impair travel on river banks by small mammals, including the otter (*Lutra lutra*), and by animals flying along the forest canopy (including bats). Although the river corridor is already fragmented by the existing road (2 bridges), it will be further fragmented by the proposed road.	Construction in the river and the locating access roads and other habitats (MIT01). In Drenovo Go slope habitats means that seve and riparian forest - causing di Measures will be taken to res construction (MIT05 & MIT06) from new obstacles across th The increase in fragmentati bats between the river vall Drenovo gorge using palisa river banks can still be use to ensure that these meas on the other 4 bridges in	
Temporary streams Project construction area includes this NATURAL HABITAT	Temporary streams are habitats associated to hills in the eastern part of the study area. They allow movement by small vertebrate fauna, including amphibians, bats and mammals (including unconfirmed marbled polecat (*Vormela peregusna*), between the hills and the Raeo river valley. This habitat will be crossed 16 times by the project (15 times with a culvert structure and 1 time with a bridge structure). Small vertebrates will be able to cross the road safely at these points (but will be temporarily impaired during construction). However, some increase in mortality is expected as animals cross the road outside these underpasses. Mortality on the existing road will be reduced through lower traffic.	The loss of temporary and other works relat	

Habitat

Residual Impacts

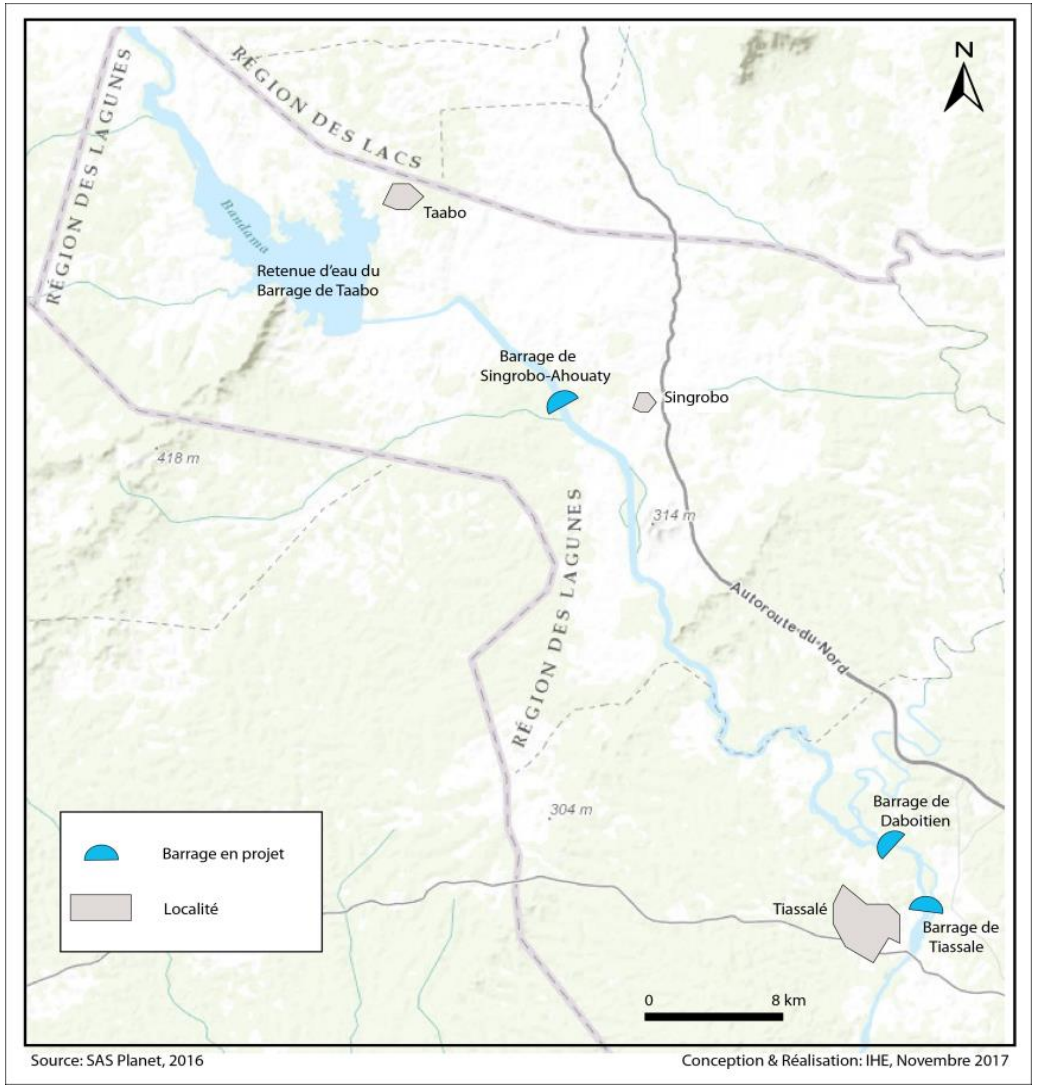
Offset

Net Impact

Does the EIA explain if and how No Net Loss or Net Gain will be achieved?

Managing impacts: Alternatives analysis

What are the alternatives?



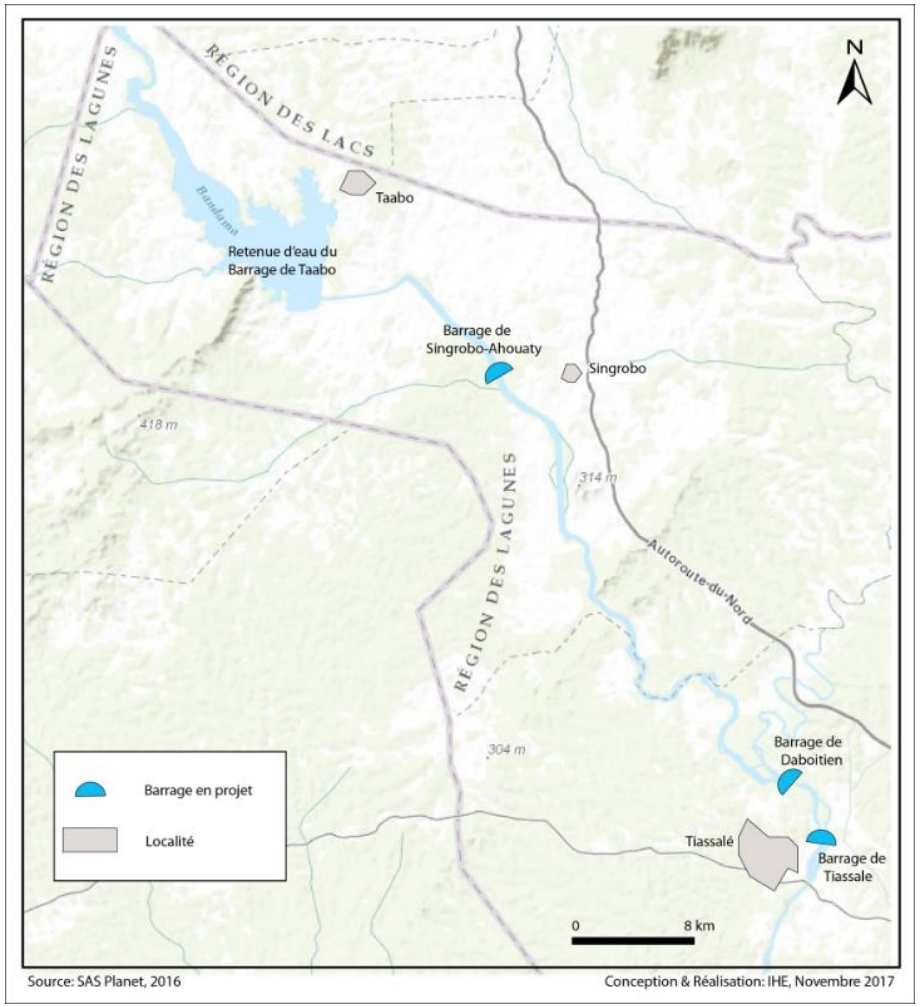
Using multi-criteria analysis to ensure the best site is chosen

Alternatives analysis : the case of a dam in Ivory Coast

- *No strategic environmental evaluation!*

- Choice of the Bandama river:
  - Already two dams: Kossou & Taabo
  - Agricultural landscape with only relictual natural habitats
  - Less than 200 km from Abidjan.

- Opportunities on the Bandama studied since the 1970s
  - Singrobo-Ahouaty
  - Daboitié
  - Tiassalé.



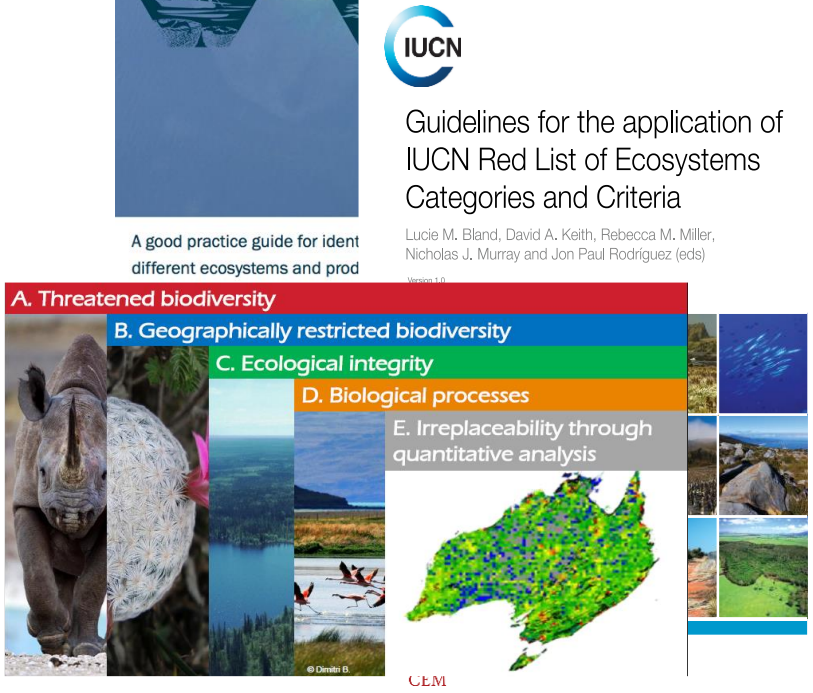
Alternatives analysis

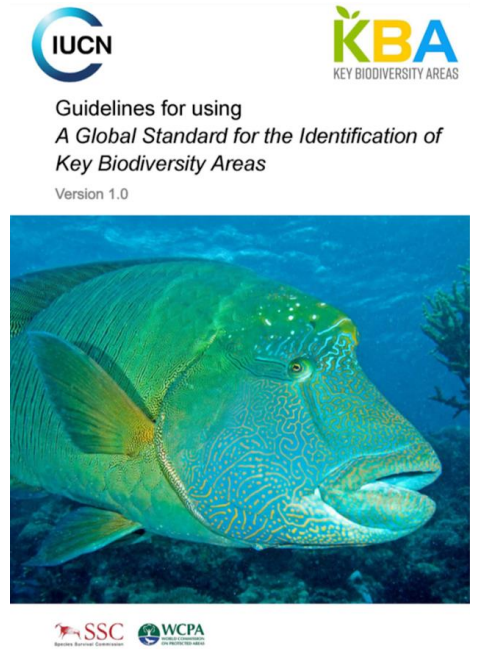
Récepteur	Singrobo-Ahouaty		Daboitié		Tiassalé	
Capacité installée	44 MW		50 à 60 MW		35 à 40 MW	
Superficie du réservoir noyée	18 km²		110 km²		7 km²	
Superficie des habitats terrestres noyés	Rives et îles	-1	Rives et îles	-2	Rives et îles	-1
Déplacement physique	2 foyers	0	probablement des milliers de foyers	-2	probablement des centaines de foyers	-2
Déplacement économique	700 foyers	-1	probablement des dizaines de milliers de foyers	-2	probablement des milliers de foyers	-2
Impact sur les infrastructures publiques	création d'un passage par-dessus le Bandama entre Singrobo et Ahouaty	+1	ensemble des voies de circulation à réorganiser, autoroute à déplacer	-2	pont déjà existant à Tiassalé	0
Impact sur la pêche (poissons)	Développement du potentiel halieutique	+1	Développement du potentiel halieutique	+1	Développement du potentiel halieutique	+1
Impact sur la pêche (crevettes)	Impact à l'amont du barrage jusqu'à Taabo (15 km de rivière)	-1	Impact à l'amont du barrage jusqu'à Taabo (50 km de rivière) et sur le Nzi	-2	Impact à l'amont du barrage jusqu'à Taabo (55 km de rivière) et sur le Nzi	-2
Impacts sur l'agriculture	agriculture familiale et grandes exploitations à l'échelle de la retenue	-1	agriculture familiale et grandes exploitations à l'échelle de la retenue	-2	agriculture familiale à l'échelle de la retenue	-1
Milieux aquatiques convertis en milieu lentique	Bandama: 17 km	-1	Bandama: env. 35 km Nzi: env. 50 km	-2	Bandama: 7km	-1
Surfaces forestières noyées	environ 5 km²	-1	environ 50 km²	-2	environ 2 km²	-1
Aires protégées ou reconnues internationalement impactées	Réserve de Lamto (impact direct)	-1	Aucune	0	Aucune	0
Impacts sur les îles du Bandama et leurs habitats potentiellement critiques	Bandama: 17 km	-2	Bandama: env. 35 km Nzi: env. 50 km	-2	Bandama: 7km	-1
Total des points		-7		-13		-10

Managing impacts on biodiversity of significant conservation concern

Priority biodiversity values

- Various safeguards and standards to identify areas of priority biodiversity values
- Industry – e.g. Forestry Stewardship Council and RSPO - High Conservation Value (HCV)
- Finance – e.g. International Finance Corporation PS6, World Bank ESF6 (natural and critical habitat)
- Conservation community – Key Biodiversity Areas, etc.





Can a project be done in critical habitat?

Yes, if:

- No other viable alternatives within the region exists in non-critical habitat (PS1: Alternatives Analysis)
- The project does not lead to measurable adverse impacts on the biodiversity values that make it Critical Habitat
- The project does not lead to a net reduction in the global and/or national/regional population of any CR or EN species
- A robust long-term biodiversity monitoring and evaluation plan is integrated into management plans
- Experts are involved to evaluate the biodiversity values and to design mitigation and offsets as needed

Key steps in critical habitat assessment

1. Screen possible triggers

- IUCN
- Literature
- Specialist interviews

➔ List candidate species (with justification)

➔ Determine if habitat type is likely “threatened ecosystem” (with justification)

2. Conduct field surveys

- Design field surveys designed to find candidate species (e.g. in certain habitat types)
- Confirm species presence
- Map and describe condition of species habitats

➔ List CH trigger species and ecosystems (with justification)

3. Define Discrete Management Units

- Determine which species share a DMU
- Map each DMU

4. Assess DMU

- Analyse DMU relative to global and national status of each species and ecosystem (%)
- Determine if DMU is critical using thresholds in PS6

➔ List which DMUs are Critical Habitat and which are not

- Map Critical Habitat DMUs, including condition levels

5. Assess impacts on DMUs

- Map project footprint and other impacts
- Overlay with Critical Habitat DMU

➔ Quantify impacts (area lost, area x condition lost, etc.)

- Apply mitigation hierarchy

Priority biodiversity

Threatened species (redlisted)

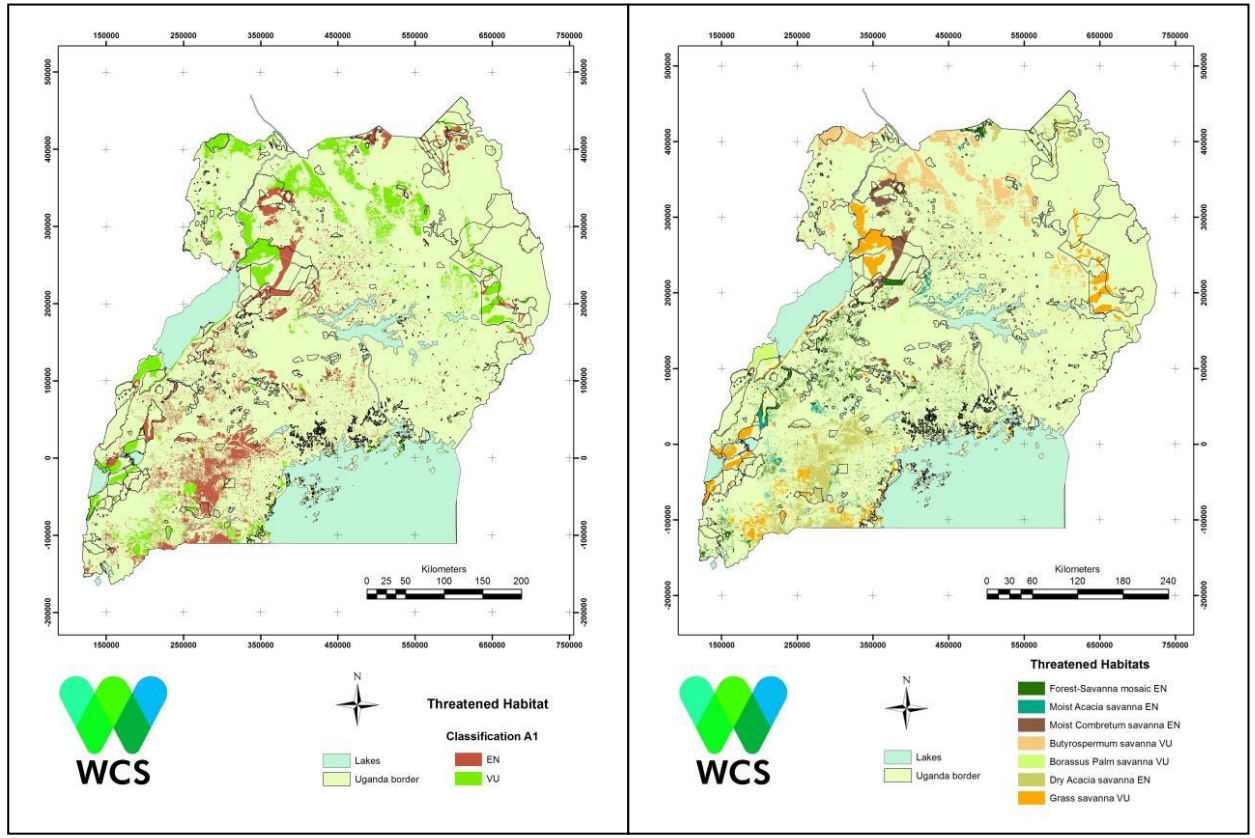
Table 1. Numbers of globally and nationally threatened terrestrial vertebrates and plants in Uganda

	Taxon	Mammal	Bird	Reptile	Amphibian	Plant	Vertebrates
	Total species	396	1,043	220	83	3,662	1,742
Globally threatened	CR	1	4	0	1	3	6
	EN	9	8	0	1	4	18
	VU	17	11	2	3	35	33
	DD	12	2	1	7	3	22
	Total Global	**39**	**25**	**3**	**12**	**45**	**79**
Nationally Threatened	CR	14	9	4	1	15	28
	EN	25	24	8	9	27	66
	VU	38	52	17	7	38	114
	DD	40	28	48	16	3	132
	RE	2	1	0	0	0	3
	Total National	**119**	**114**	**77**	**33**	**83**	**343**

Priority biodiversity

Threatened ecosystems

Alaniz, A. J., Galleguillos, M., & Perez-Quezada, J. F. (2016). Assessment of quality of input data used to classify ecosystems according to the IUCN Red List methodology: The case of the central Chile hotspot. *Biological Conservation*, *204*, 378-385.



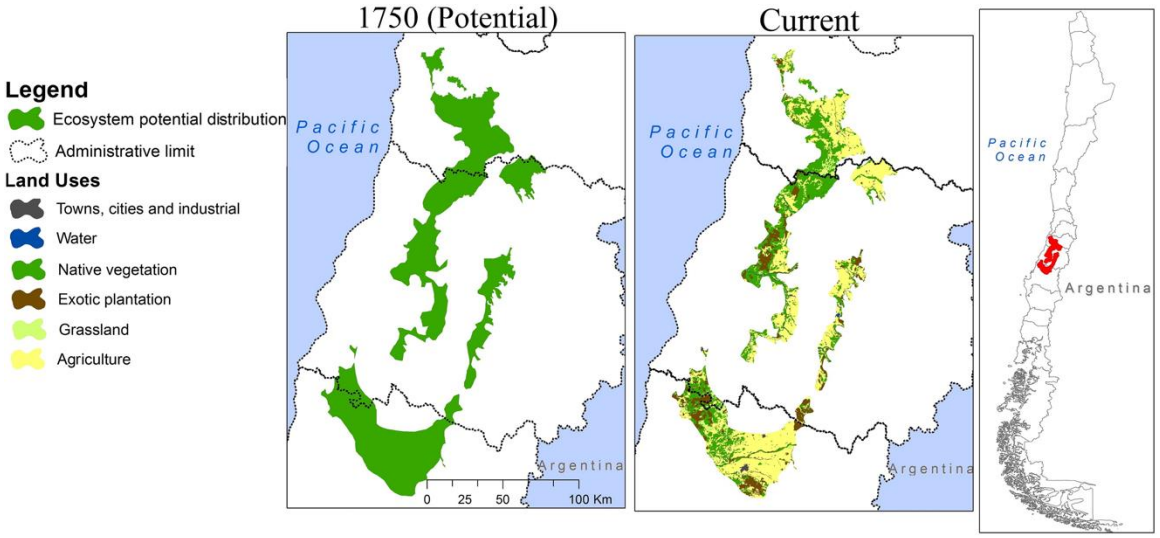
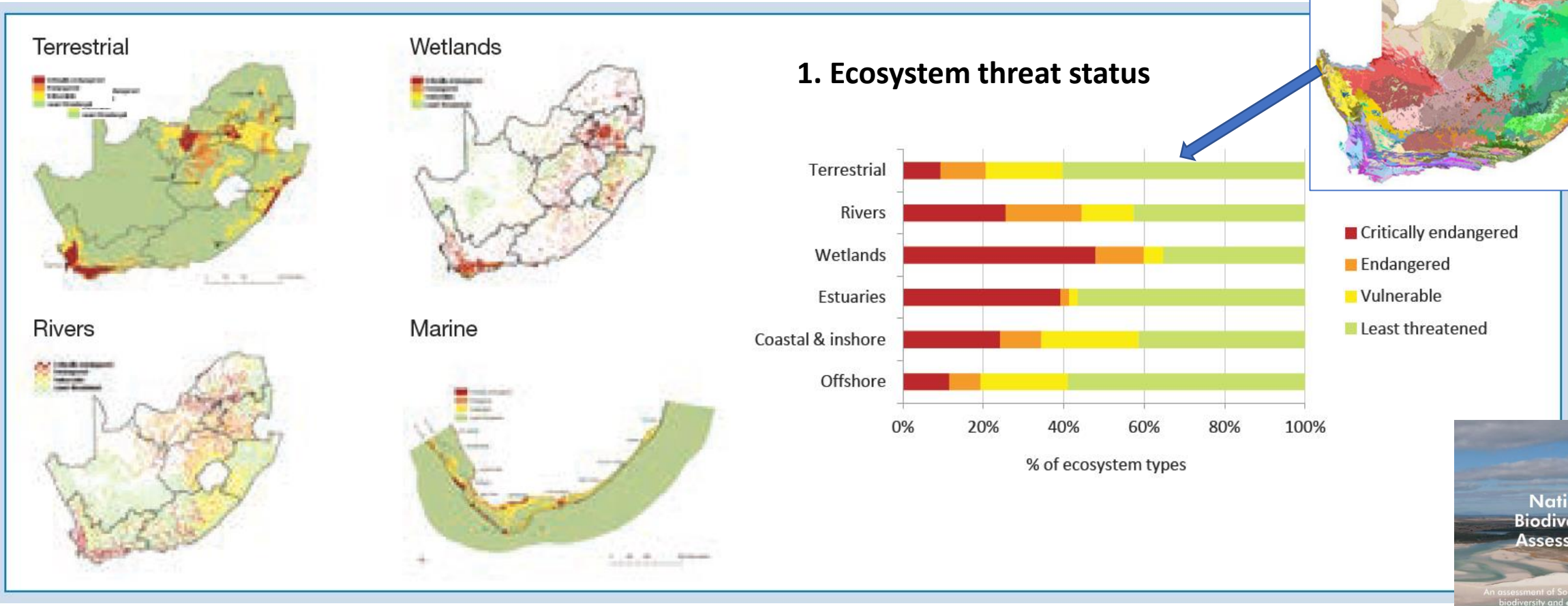
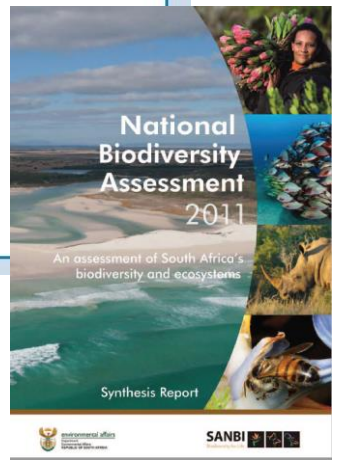


Figure 3. Classification of Threatened habitat (left) and named threatened habitat types (right)

Priority biodiversity

Threatened (redlisted) ecosystems across realms



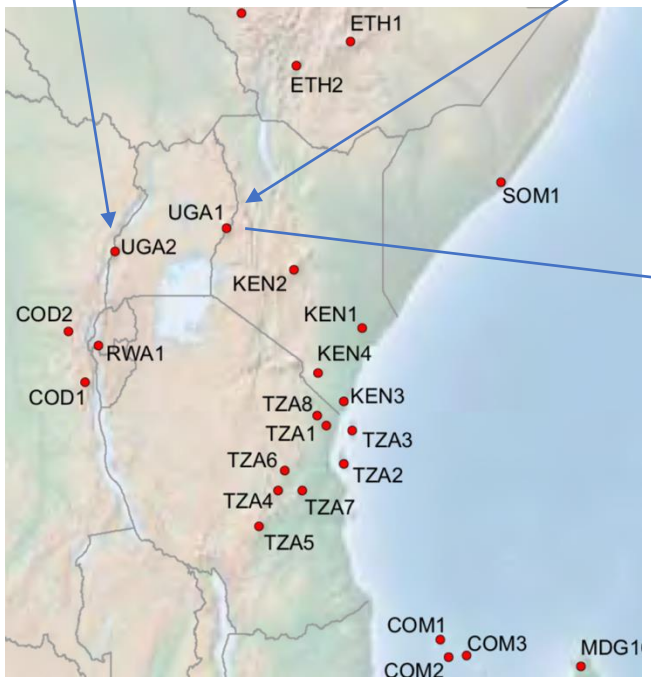


Priority biodiversity

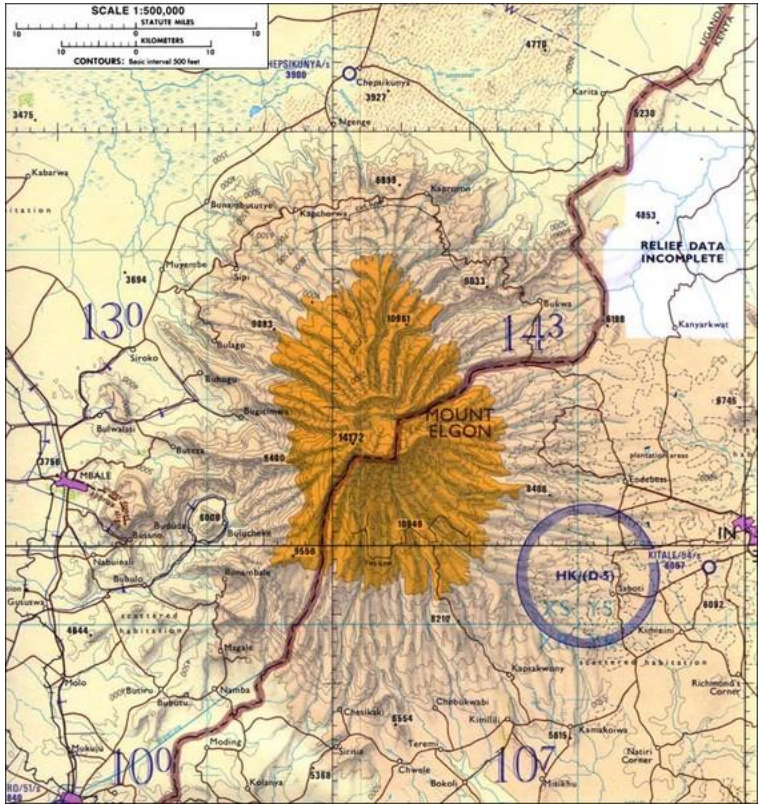
Geographically restricted

Ruwenzori Mountains NP (Montane Shaggy Rat)

Mt Elgon (Du Toit's Torrent Frog, Barbour's Vlei Rat)



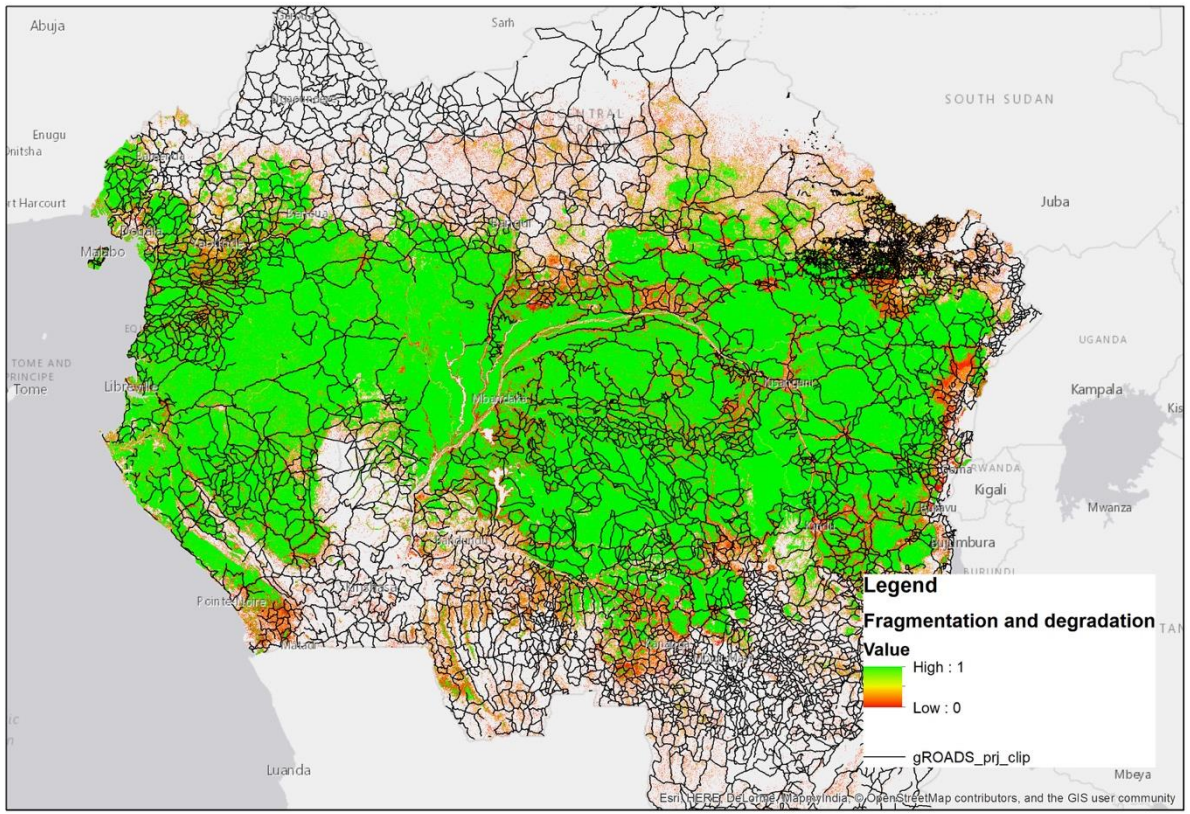
Alliance for Zero Extinction Sites



https://globally-threatened-bird-forums.birdlife.org/category/aze-alliance-for-zero-extinction/

Priority biodiversity

Ecologically intact ecosystems



- Earth is now largely human-dominated
- Increasingly recognized that the last intact areas have very high conservation value

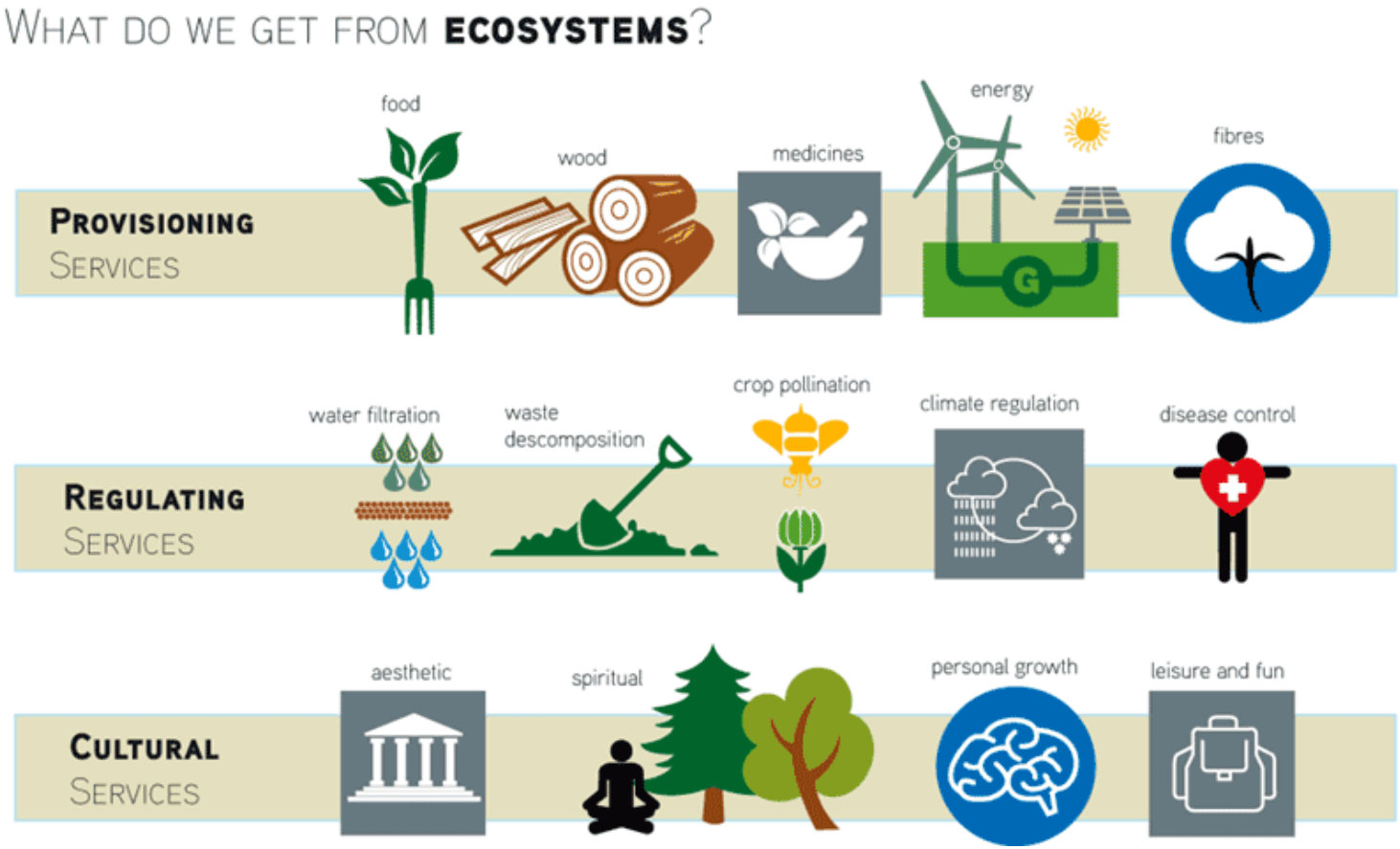
Priority biodiversity

Biologically important

- Demographic aggregations (e.g. wildlife)
- Climate refugia
- Recruitment sources

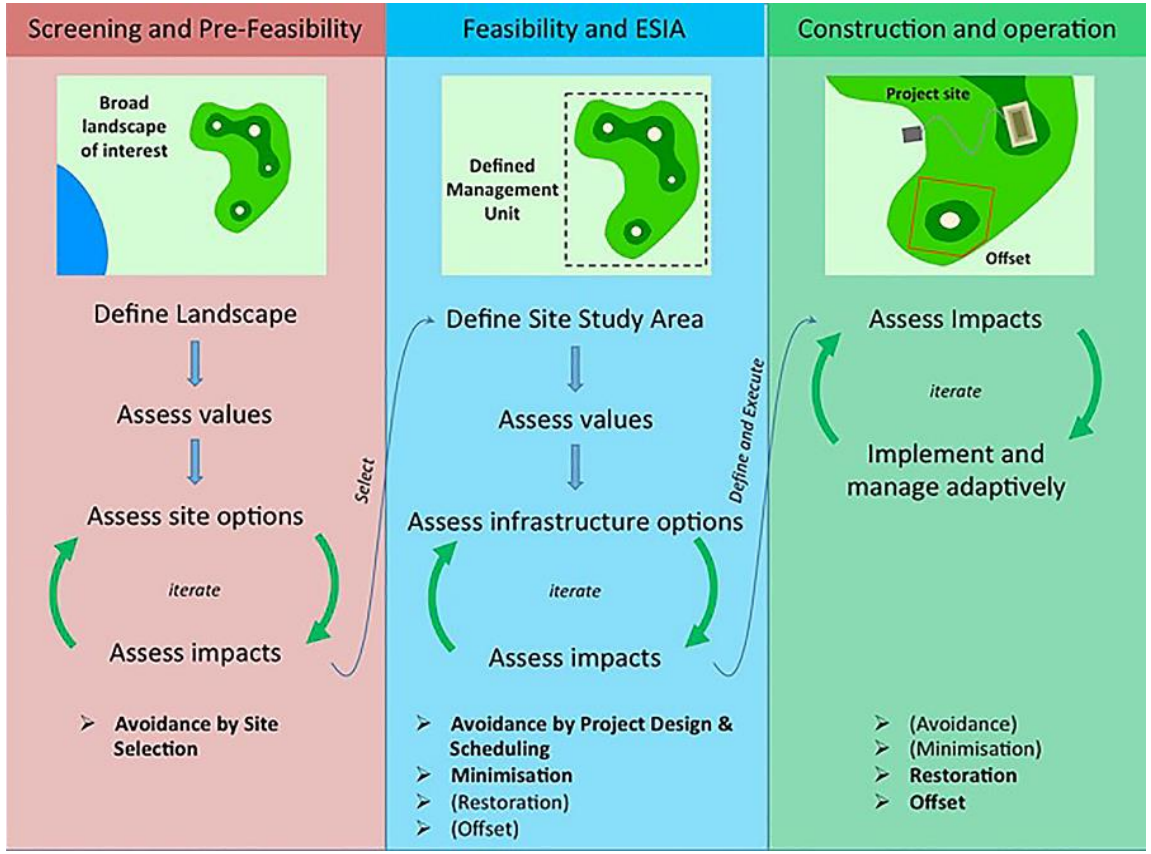
Priority biodiversity

Underpinning ecosystem services



Using landscape plans to inform development projects

Figure 6: Applying the mitigation hierarchy at different stages of the project time line

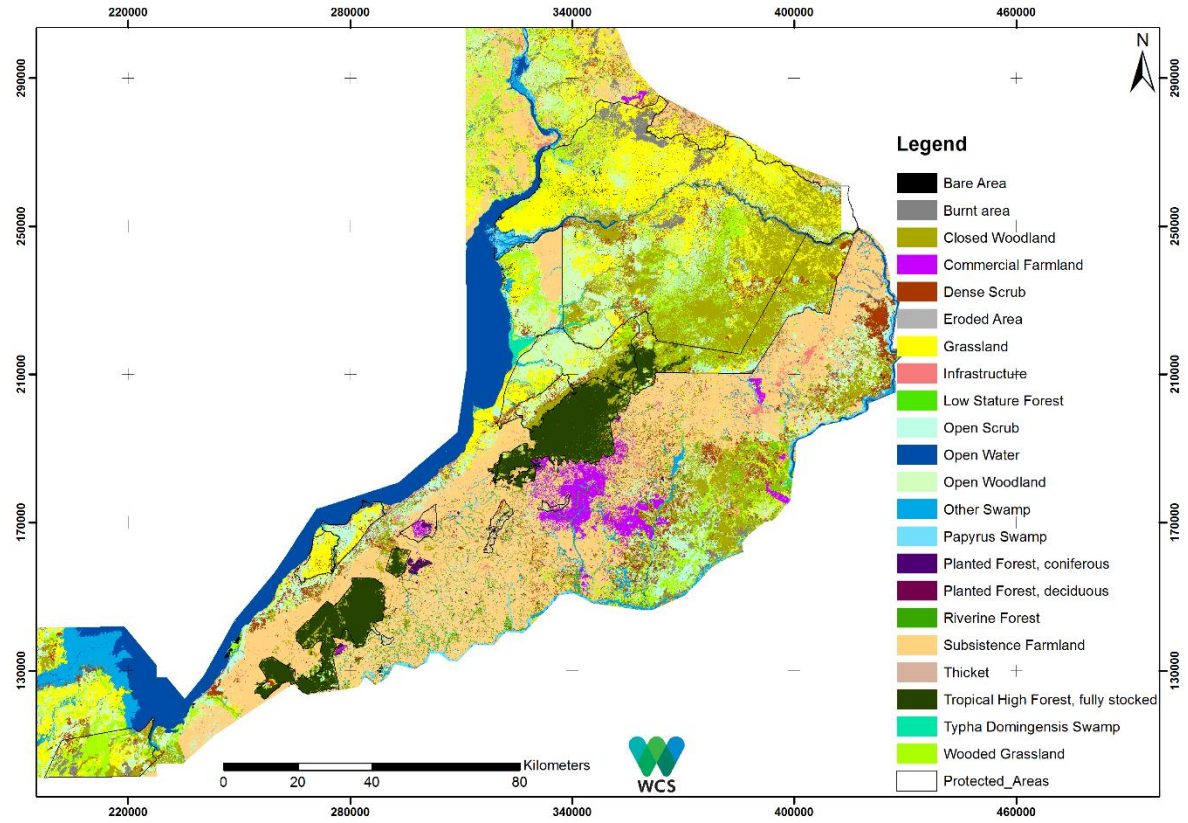


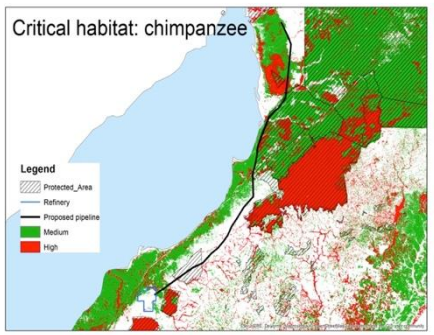
Note: The selection of project sites through landscape-level screening occurs in the pre-feasibility phase. Once a site has been chosen, further avoidance and minimisation may be possible within the project site. During construction and operation, implementation requires adaptive management. Iterative processes (shown by the green arrows) are important throughout.

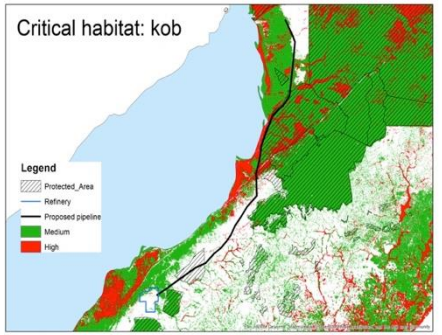
Source: adapted from CSBI (2015).

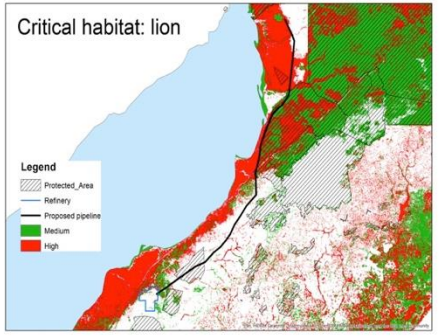
- Development projects often start with site selection then project design
- Good data and landscape planning can help inform projects is their early design phase to minimize impacts

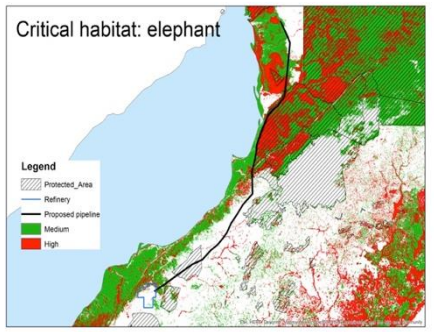
Example of mapping critical habitat at the landscape scale

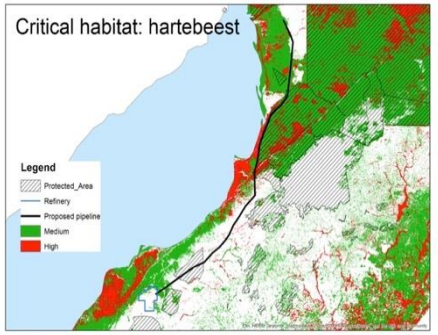


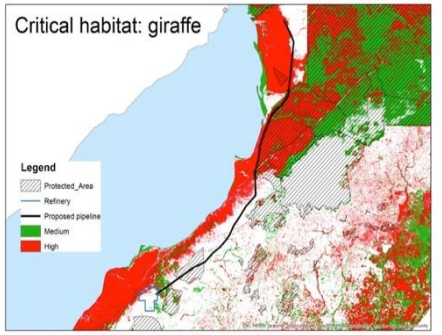












Managing impacts:
Environmental Management Plans

What is an Environmental Management Plan (EMP)?

An EMP is an environmental management **tool** used **to ensure** that undue or reasonably avoidable adverse **impacts** of the **construction** and **operation**, and **decommissioning** of a project, are prevented; and that positive benefits of the projects are enhanced

EMPs are usually prepared following an EIA and incorporate the proposed **management actions** (avoidance, minimization, etc.) and are essential for **monitoring** environmental performance

EMPs are tools: they must be practical, detailed and project-specific

EMPs must refer to impacts and to the mitigation and offsetting commitments made in the EIA process

EMPs must cover the entire project life-cycle

EMPs must include indicators to enable monitoring and auditing

What is a Biodiversity Action Plan (BAP)?

A BAP is the equivalent of an EMP for managing impacts on biodiversity throughout the project life-cycle …

The BAP is an important part of the EMP.

The BAP can include a Biodiversity Offset Management Plan (BOMP)

BAPs are tools: they must be practical, detailed and project-specific

BAPs must refer to impacts and to the mitigation and offsetting commitments made in the EIA process

BAPs must cover the entire project life-cycle

BAPs must include indicators to enable monitoring and auditing

Key objectives of an EMP & BAP

- Ensuring compliance with regulations and permits
- Ensuring there are enough resources (staff, budget) to implement mitigation and offsetting measures
- Verifying environmental performance through impacts as they occur
- Responding to changes in project implementation not considered in the EIA (adaptive management)
- Responding to unforeseen events
- Providing feedback for continuous improvement

Key contents of the EMP / BAP

- Definition of the environmental / biodiversity goals of the project
  - No net loss of biodiversity?
- Detailed description of avoidance, minimization, restoration / rehabilitation and offsetting measures to be implemented during the life of the project to address likely impacts
- Detailed description of monitoring / verification processes
- Detailed description of mechanisms for addressing changes in project design, implementation and unforeseen events (accidents)
- Detailed description of internal and external governance: roles and responsibilities, communication and reporting processes

Actions:
- Who?
- When?
- How?

Adaptive management

Who's in charge?

EMP contents

- Project description
  - Project facilities
  - Project activities
  - Legal context (zoning, applicable regulations, etc.)
- Summary of likely impacts
  - Species, habitats, etc.
  - Impacts per phase / facility / activity
- Presentation of environmental policies and commitments
  - Project governance
  - Corporate policies / applicable procedures and guidance
  - Applicable certification (e.g. ISO 14001)
- Implementation programme
  - Detailed description of actions
- Roles and responsabilities
  - Communication channels
  - Requirements for contractors and sub-contractors
  - Terms of reference for key positions

Some of the most important information for the EMP is found in the EIA

The implementation programme is the core of the EMP

Adjusting the EMP to the project context and scale

The EMP must be adapted to the risks the project faces

- Low vs. high risk projects (see EIA)
- Simple vs. complex projects (e.g. multiple subcontractors)
- Short-term vs. long-term projects (need for adaptative management)

The EMP can include separate thematic components

- Biodiversity management
- Waste management
- Dust management
- Noise management
- …

Biodiversity Action Plans are a part of the Environmental Management Plans

How should EMP actions be presented?

- **Written:** Management actions should be stipulated in writing, this forces the formulators to think through each action carefully.
- **Dated:** A management action must indicate a specific time by when the action should be implemented.
- **Risk- or impact-specific:** Each management action must link to a specific impact (either positive or negative) or environmental risk, and should be worded in specific terms rather than in general terms.
- **Time and space specific:** An indication must be given as to the conditions under which the management action applies (continuously or only in the event of contingencies). The time (such as the season or time of day) and location of the application of the management action.
- **Measurable:** Management actions must, where possible, be quantitatively defined. A standard with which performance can be compared, must thus be set. Objectives and targets of the management action must be clearly stated.
- **Achievable:** The management action must be realistic, feasible and hence achievable;
- **Reasonable:** The management action must be readily implementable within the time and budget constraints of a project.
- **Timely:** Measures must be put in place to coincide with specific project activities.
- **Understandable:** Management actions must be described simply, using clear, non-technical language where possible.

EMP implementation programme

- Objectives
- Actions
- Implementation schedule
- Budget
- Responsabilities
- Indicators
- Monitoring

Actions are taken from the EIA (avoidance, minimization, restoration/rehabilitation, offsets) and operationalized

Actions must be clearly defined: What, who, when, where, how?

Smart indicators are used to track implementation and performance

Who is responsible?

- The developer is responsible for implementing the EMP
  - Polluter-pays principle
  - Legal liability: permits refer to the EMP
  - Financial liability: investment conditionalities refer to the EMP
- The internal organization of the developer is essential to the effective implementation of the EMP
  - Which department / service is responsible for a given action?
  - Key staff must be trained!
- Certain actions can be delegated / contracted to third-parties
  - Contracts must also transfer responsibilities for actions
- The budget has to be sufficient to cover the cost of the EMP
- A process must be in place to introduce corrective actions
  - Updating the EMP
  - Triggering particular actions (e.g. to clean-up pollution)

Example: Who is responsible?

Developer: terms of reference & procurement

University: monitoring

Consultants:
- Technical assistance
- Audits

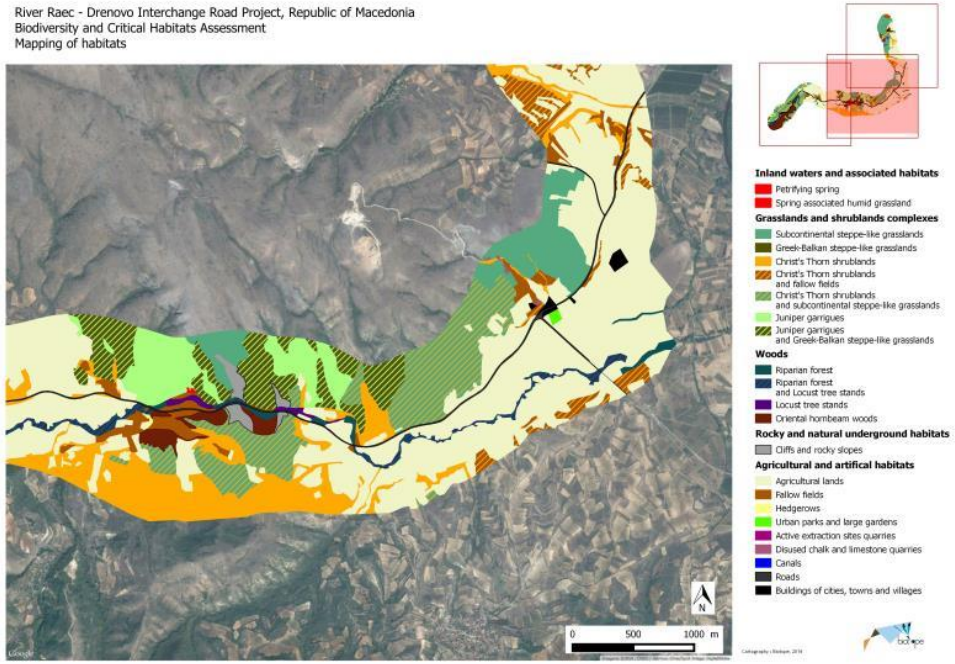
Management of the offset

Public lands agency:
- Provides access to land
- Signs contract with developer
- Signs contracts with local communities
- Audits

Implementation of the offset

Public lands agency: Supervision of restoration

Local communities: Restoration works



"Gains" for grasslands: restore 15 ha of degraded grasslands in the landscape

will be done by a qualified plant ecologist and take into account access to land by contacting land owners and land users. It

Offset includes monitoring of baseline and restoration effects + governance

have to be restored, thereby extending OFF02.

Governance : key elements

- Action management / supervision
  - Who prepares the terms of reference?
  - Who signs contracts with suppliers / service providers?
  - Is technical assistance needed?
- Action monitoring
  - Independent monitoring?
  - Experienced and skilled staff?
  - Decision process to act on monitoring results?
- Action implementation
  - Experienced and skilled staff?
  - Equipment?
- Auditing
  - Which government bodies are involved?
  - How are their costs covered?

A clear chain of command / responsibility is necessary to ensure actions are implemented

Training may be necessary

Monitoring must inform EMP implementation / adaptation

Anticipating failures and failings

- A process must be in place to introduce corrective actions
  - Updating the EMP
  - Implementing pre-identified corrective actions
- Monitoring must provide information to trigger corrective actions
- Corrective actions can be pre-identified and their feasibility pre-assessed

Don’t pretend that things will go “according to plan”. They won’t.

Egyptian vulture: planned response in case mitigation fails

Although the absence of a breeding pair or an unsuccessful breeding attempt may not be the result of project related impacts - this could be the result of natural mortality, predation, poaching etc. - a worst case scenario requires that an adequate response be prepared. Monitoring during construction (MON01) and operations (MON02) will conclude on the level of residual impact of the road project on the breeding success of the Egyptian vulture in the gorge. This will determine the offsetting level for this species.

As a first approximation, the following situations are contemplated as part of this adaptive offsetting strategy:

- In case there is no breeding pair in the gorge the year the works are planned and before they begin (beginning of MON01), no offsetting measures would be needed because there would be no relationship between the works and the absence of the Vulture.
- In case of breeding failure during construction phase (MON01) or one time during operation phase (MON02), the relationship between disturbance by works, traffic or road maintenance and breeding failure will have to be estimated. If an obvious link between the failure and any event during the works (e.g. non-expected blasting operation during the most sensitive period), a first stage of offsetting will be initiated (OFF06).
- In case of more than one breeding failure from the start of construction to the end of the fifth breeding season during operation phase (MON01 & MON02) that can be attributed to the project, the first stage of offsetting measures will be expanded into a second stage (OFF07).
- In case of continuous absence of the species on the study area of the project during the first five years of operation phase (and thus absence in Đavolja gorge breeding site), taking a precautionary perspective, a first level of offsetting measures would have to be undertaken.
- In case of continuous breeding success from road construction until the end of the first five years of operation (results of MON01 & MON02), no offsetting would be needed because of no significant disturbance by the traffic or the road maintenance will have been demonstrated. Non-significant residual impacts will have been confirmed.

In theory, any mortality or loss of reproductive output due to the project, measured in individual juveniles leaving the nest, would have to be offset bird for bird, to ensure that the project does not cause a decrease in the population of Egyptian vultures. Given the uncertainties inherent in such an approach, and until better knowledge is available to model population dynamics of the species in Macedonia, a precautionary approach is suggested. The main threat to the Egyptian vulture in Macedonia has been identified by GRUBAC, VELEVSKI & AVUKATOV (2014) to be the widespread use of poisoned baits aimed at stray dogs, foxes and wolves, which in turn poison the vultures as they feed on the dead canids. Offsets could aim to address this main threat, to contribute to stopping the decrease in the Egyptian vulture population and hopefully increase it.

Under this assumption, which would have to be adjusted and updated on the basis of actual monitoring results and population trends of the species in Macedonia, the first level of offsetting measure for the Egyptian Vulture (OFF04) could be to reduce the main threat for the species in the important Bird Area 'Đavolja river Valley' (IBA MK023): the use of poisoned baits to kill stray dogs, wolves and wolves. As an example, PESR would therefore fund the following actions, to be undertaken jointly:

- A new awareness raising campaign on alternatives to the use of poisoned baits;
- Active research of poisoning locations and rapid removal of dead wolves or dogs over a 5 years period;
- Study of the causes of vulture mortality and reproductive success in the IBA, including levels

River Đavolja Interchange Road Project. Republic Of Macedonia.
Biodiversity and Critical Habitats Assessment. Final report, September 2014

37

Budgets : key elements

- Cost components
  - Staff
  - Equipment
  - Overhead
- Costing : unit cost x quantity of units
- Quantities
  - Locations
  - Size: area
  - Duration: years

- Don’t forget:
  - Administrative cost (procurement, recruitment, contract management)
  - Financial risks (inflation & changes in exchange rates)
  - Monitoring costs
  - Auditing costs

The cost of the EMP must be factored into the Net Present Value of the project

The developer and its investors carry the financial risk … not biodiversity!

What is monitoring?

- **Biodiversity baseline** should be done prior to the start of the project
- **Performance monitoring** to ensure that environmental impacts are within the predicted levels and that specified environmental performance targets are being achieved.
- **Compliance monitoring** to check that the levels of specific environmental parameters are compliant with laws, regulations, standards or guidelines … and the project permit conditions.

The baseline is included in the EIA; it must be detailed enough to enable performance monitoring

Performance monitoring must be done throughout the project life-cycle to inform management

Compliance monitoring is done at regular intervals in the context of audits by regulatory agencies

Monitoring is essential!

Monitoring activities must focus on the information required for:

- determining whether objectives and targets are being met
- triggering corrective actions

Monitoring will be necessary and appropriate if:

- there are residual negative impacts (after mitigation) that must be minimized
- secondary negative impacts arise as a result of the mitigation measures
- there is significant public concern or controversy about a particular impact
- potential impacts are complex and poorly understood
- the effectiveness of mitigation measures is uncertain.

Not all impacts need to be monitored!

Some projects are permitted in spite of poorly understood impacts and mitigation …
and the project must manage this uncertainty

Key contents for the monitoring plan

- Indication of the linkages with impacts
- Mitigation objectives and targets for optimum performance (minimum environmental impact)
- Thresholds (including legal)
- Environmental parameters to be monitored
- Indicators to be measured
- Monitoring methods
- Sampling locations
- Frequency of sampling
- Detection limits (where appropriate)
- Reporting procedures
- Responsibility for monitoring
- Definition of thresholds that will signal the need for corrective action
- Details of how results will be analysed to determine whether corrective actions are necessary;
- Responsibility for corrective action
- Opportunities that will be provided to stakeholders to contribute to corrective actions and revisions of the EMP

Impact Assessment – Take home messages

- Environmental and social impact assessments offer a key process for applying the mitigation hierarchy and planning for NNL/BNG.
- When planning for NNL/BNG, it is essential to take account of indirect and cumulative impacts, since these are often far more significant than the direct impacts.
- Impacts caused by the project but felt outside its footprint also need to be taken into consideration.
- EIAs are rarely planned to achieve NNL/BNG, but mitigation including offsets can be integrated with the EIA process to deliver NNL/BNG.
- Other law and policy can be used as a trigger for NNL/BNG, including planning law and policy (ie permits for construction), sectoral policy (eg mining, hydropower), environment/conservation law, and Strategic Environmental Assessment.
- The mitigation hierarchy is covered in a separate module, but this module covered the vital role of alternatives analyses in the impact assessment process.
- Sensitive (high conservation value) biodiversity is a particular concern in impact assessment and mitigation and must be reviewed with great care.
- With impacts assessed and mitigation measures for NNL/BNG defined, they should be translated into an Environmental Management Plan with clear objectives, actions, implementation schedule, budget, roles and responsibilities, indicators and monitoring.