MODULE 1

INITIAL ASSESSMENT OF BIODIVERSITY STUDY DESIGN AND DATA NEEDS

Emerging Tools and Technologies Used in Terrestrial Biodiversity Assessments for Transportation Development Projects

The Modern Road Ecologist's Toolbox

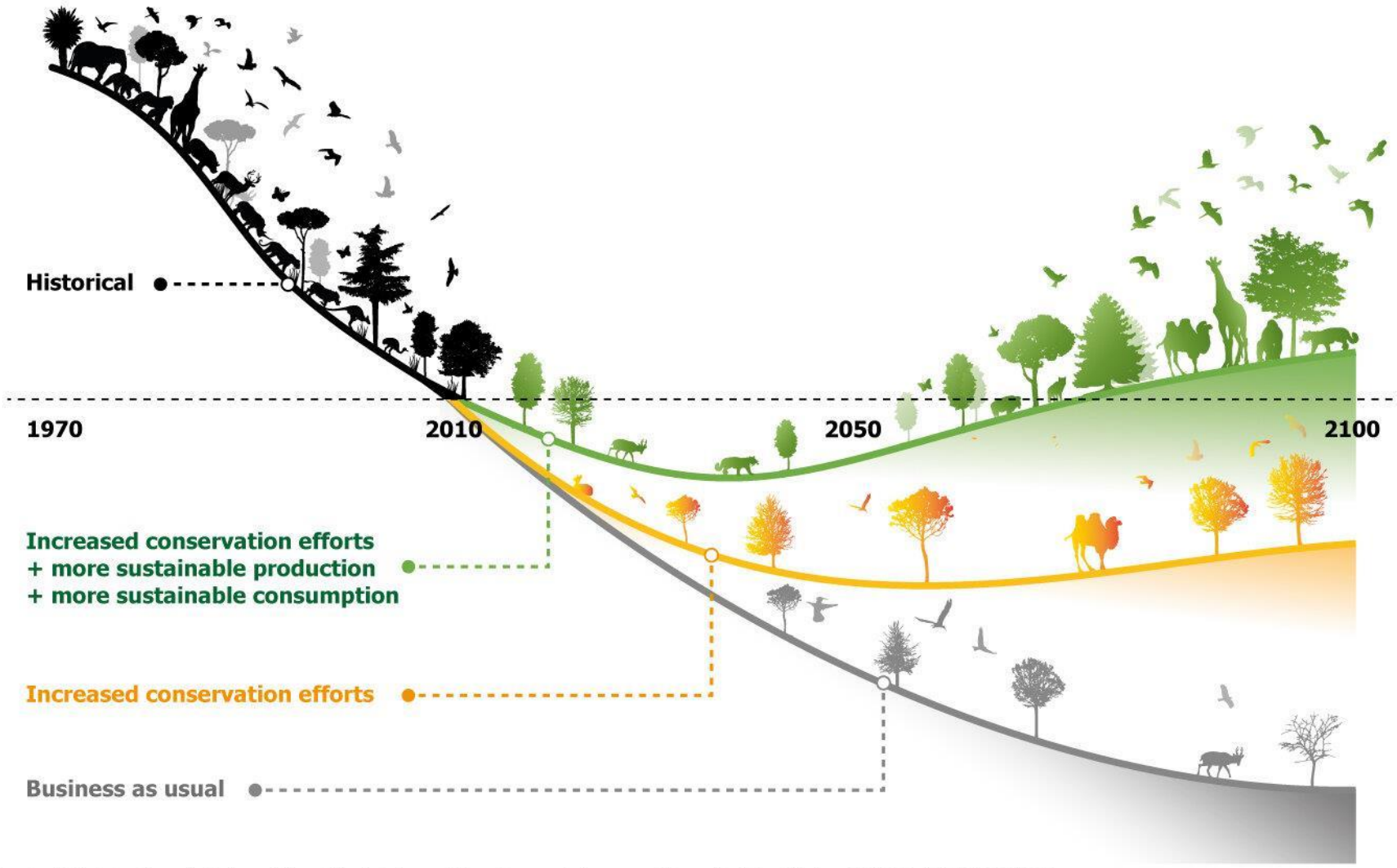
Module 1: INITIAL ASSESSMENTS FOR TRANSPORTATION INFRASTRUCTURE PROJECTS – STUDY DESIGN & DATA NEEDS

A. INTRODUCTION TO BASELINE BIODIVERSITY ASSESSMENTS & DATA NEEDS

B. TECHNICAL DEMONSTRATION OF TOOLS TO CREATE SPECIFIC WEB MAP

Biodiversity is declining across the globe at an unprecedented rate

Approximately 50 to 70% of the Earth's land surface currently modified for human activities



This artwork illustrates the main findings of the article, but does not intend to accurately represent its results (https://doi.org/10.1038/s41586-020-2705-y)

HABITAT LOSS AND FRAGMENTATION

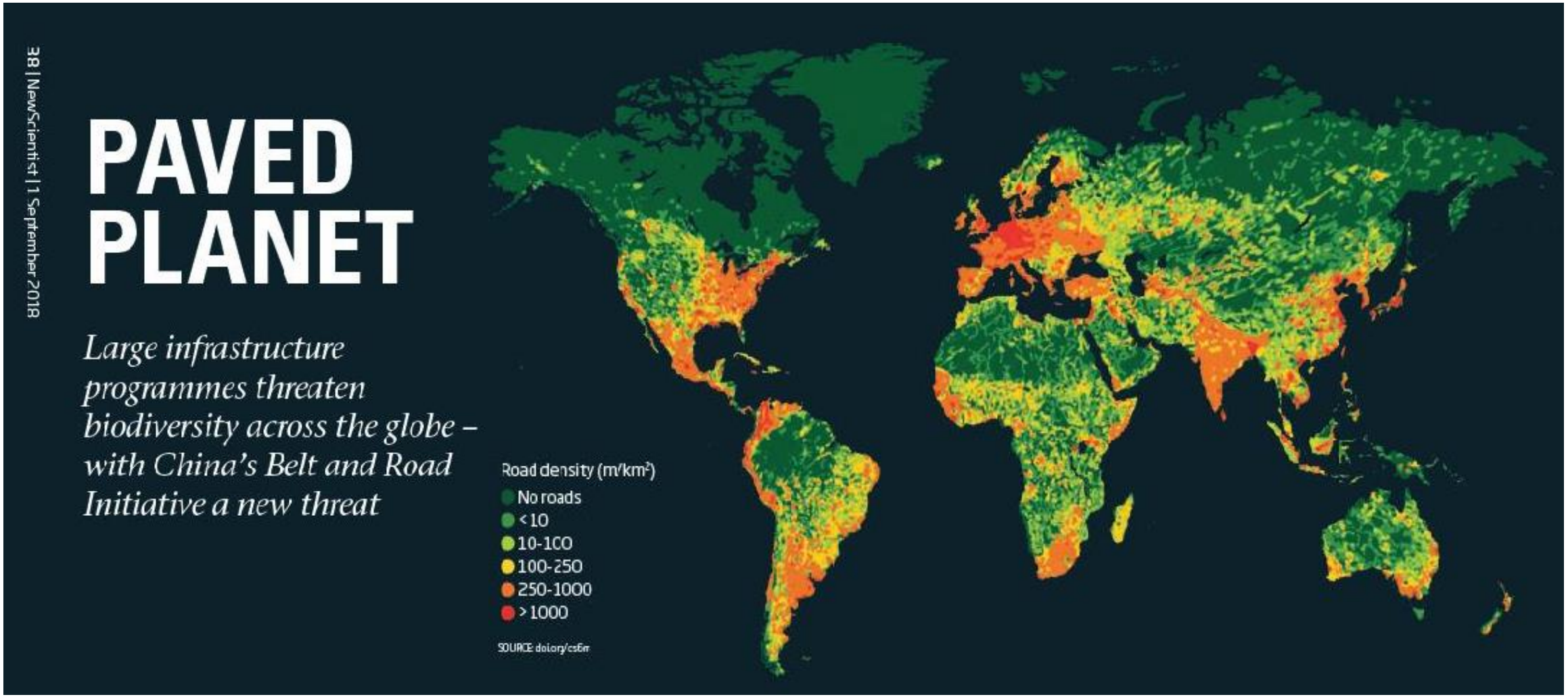
Caused by nature

Hurricanes – Fires – Drought – Insect outbreaks ….

HABITAT LOSS AND FRAGMENTATION

Caused by humans

12 million km roads built since 2000
25 million km roads projected to be built by 2050 (Dulac, J. 2013.)



Lawton, G. 2018. Road kill. New Scientist.

Impacts of Roads

- Direct effects
- Indirect effects
- Road Effect Zone

Brady et al. 2017

Focus of webinar

Conservation of Biodiversity and Wildlife Populations

Asia is Global Biodiversity Hotspot

Among 25 of the world's biodiversity hot spots, 7 are in Asia*

Without proper safeguards, ongoing and anticipated expansion of LI will further fragment habitat, increase wildlife mortality, and threaten biodiversity.

*Meyers et al. 2000

CONTENT

Baseline Biodiversity Assessments (BBA)

1. What do we need to know? (Objectives)

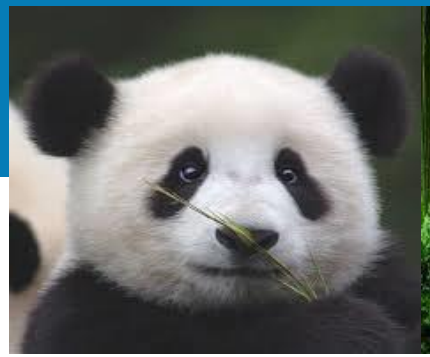
2. How do we do it? (Methods)

3. What are our Outputs (Results)

4. Case Studies of BBAs in Action
   Bhutan – *National Highways 2 & 5*
   Bangladesh – *Chittagong – Cox's Bazar Railway*

Challenges of managing, describing and sharing data

HABITAT









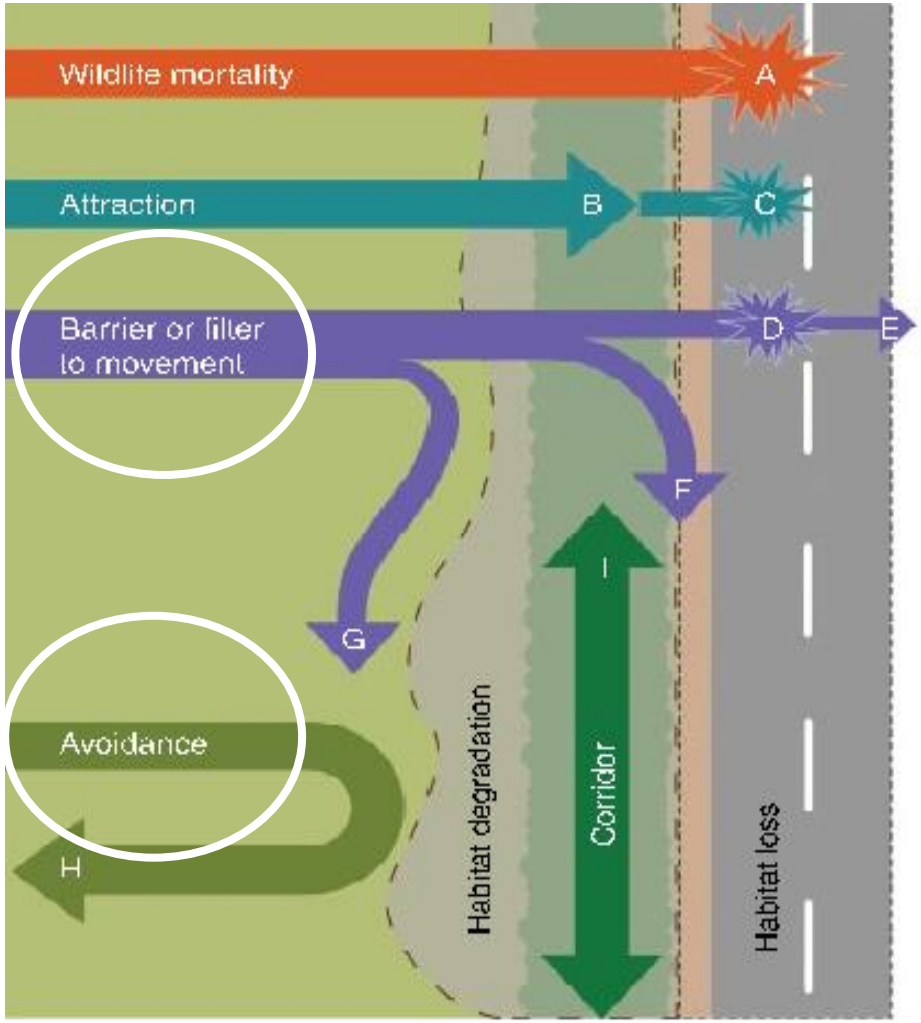



…is a place where
an organism makes its home.

…meets all the environmental conditions an organism needs to survive.

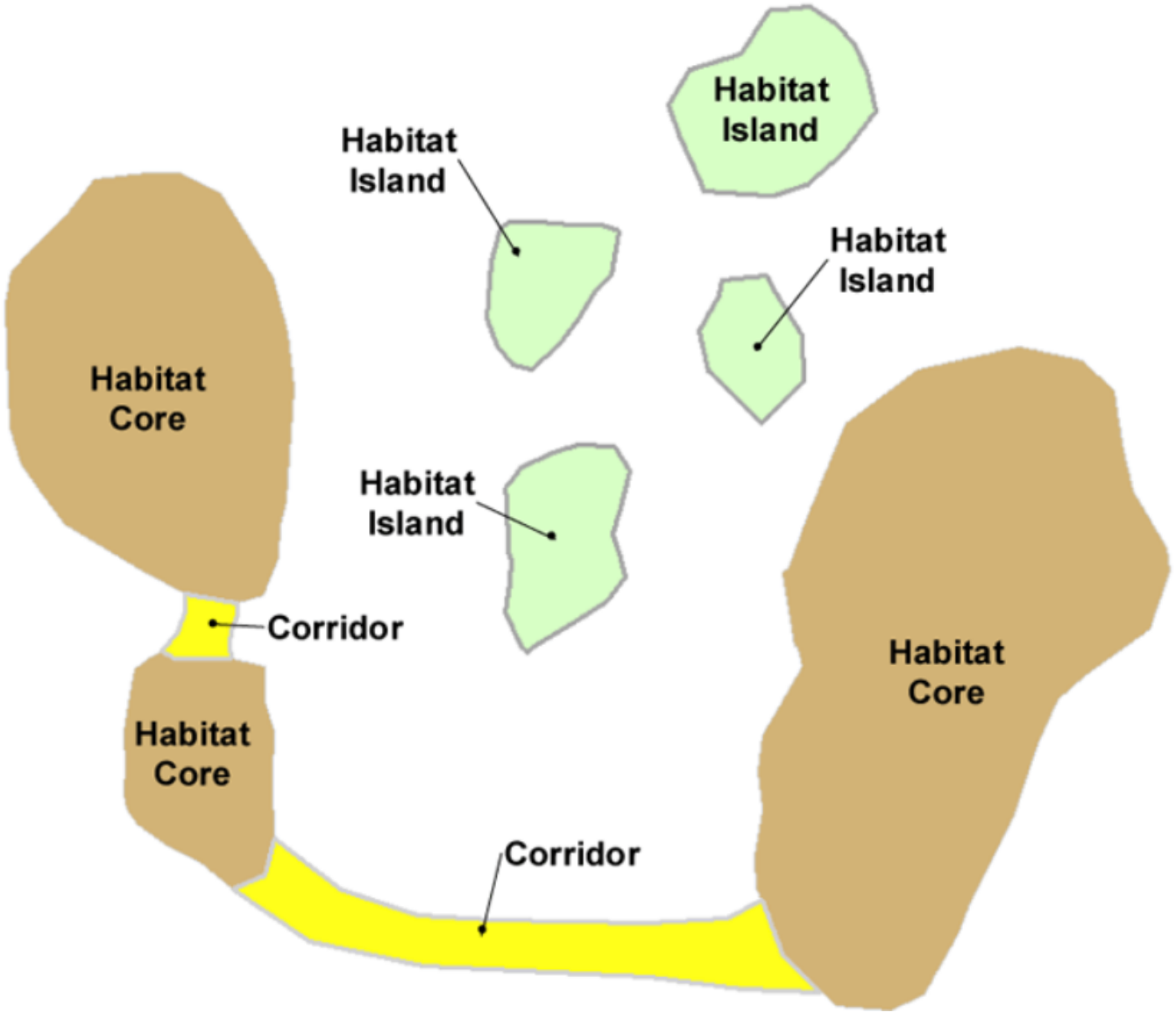
…..everything it needs to find and gather food, select a mate, and successfully reproduce

HABITAT LOSS AND FRAGMENTATION *VS.* ROADS



van der Ree, Smith, Grilo 2015. Handbook of Road Ecology.

HABITAT CORRIDORS



Components of the landscape that facilitate the movement of organisms and processes between areas of intact habitat.

Center For Large Landscape Conservation

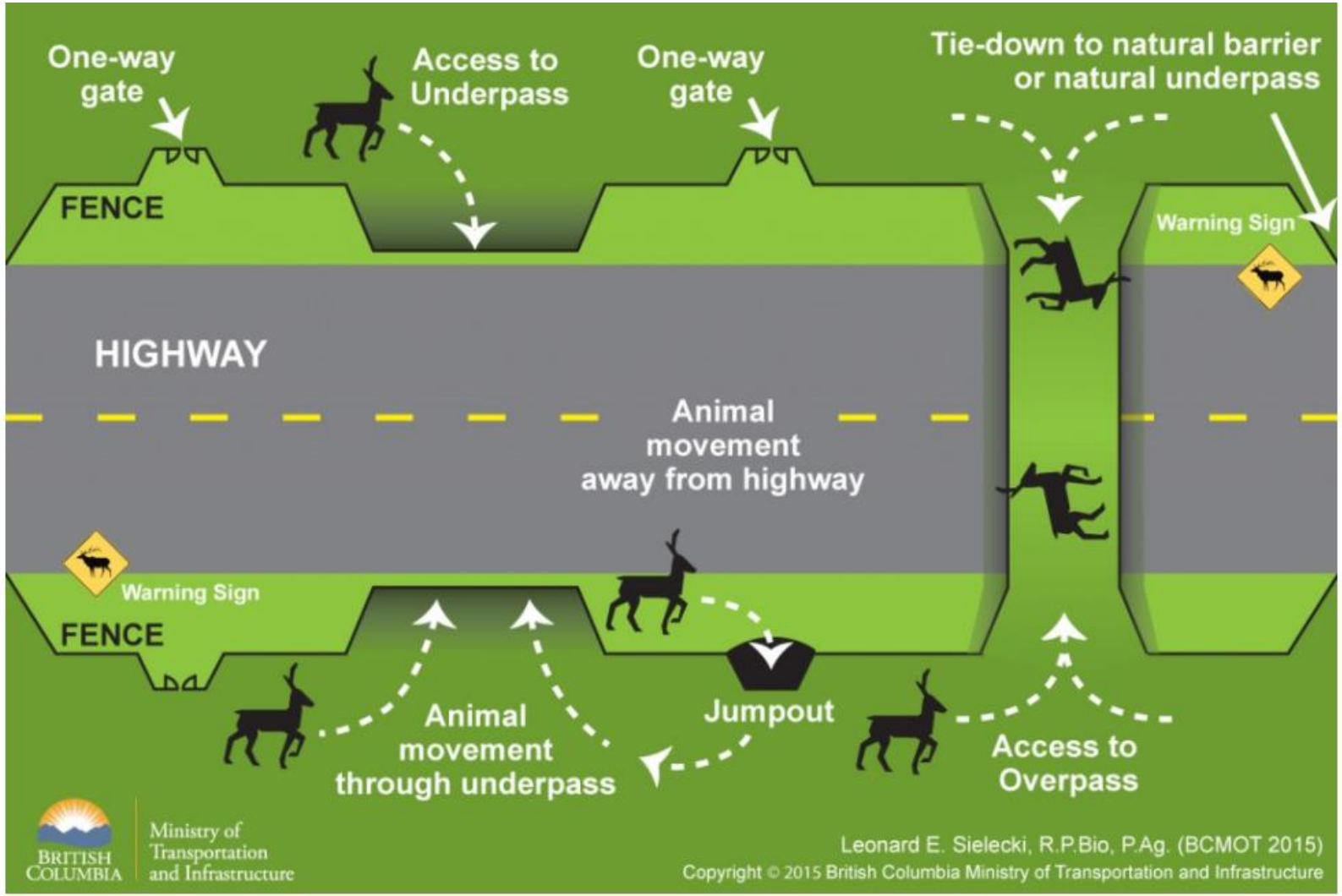
Keeping Connections Intact

LANDSCAPE PERMEABILITY

» OVERPASSES
- Tunnels

» UNDERPASSES
- Flyovers

» FENCING
- No fence



MITIGATION HIERARCHY

1. AVOID
2. MINIMIZE/MITIGATE
3. COMPENSATE

RED FLAG PROJECTS

RED FLAG PROJECTS

WORLD VIEW *A personal take on events*

MARCUS GUERRA

If you can't build well, then build nothing at all

Scientists must call out — not merely greenwash — infrastructure building that will ruin environments, lives and economies, urges **William Laurance**.

Nature 563: 295 (15 Nov 2018)

ENVIRONMENTAL IMPACT ASSESSMENTS

GENERAL IN DESCRIPTION OF IMPACTS

Physical, Ecological, Social, Cultural

“CATEGORY A” – Need greater scrutiny and detail

Baseline Biodiversity Assessment (BBA)

Who does this ? – Subject matter experts

WHAT WE NEED TO KNOW (OBJECTIVES)

IMPACTS TO WILDLIFE:

- MORTALITY – *VEHICLE CAUSED*
- MOVEMENTS – *DISRUPTED*

DEFINE BIODIVERSITY or FOCAL TAXA

1. Large/Iconic Species (Conservation Concern)
2. Arboreal/Canopy-dwellers
3. Small/Medium Terrestrial Vertebrates

Near Parsa NP, NEPAL (2021)

Roadkill survey
METHODS

Camera Sign survey

Underpass in use

METHODS

Forest Inventory

FD forester measuring tree with dbh tape

Bird survey

METHODS

Arboreal Canopy-dwellers

Canopy Camera Trap

Bird survey

METHODS

Small/medium-sized Terrestrial vertebrates

LIVE TRAPS

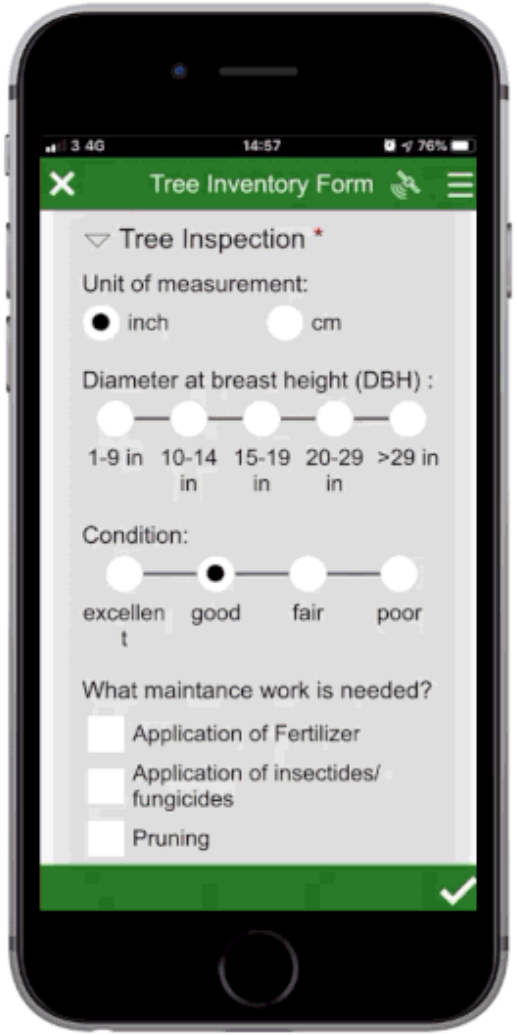
- *CAPTURE-MARK-RECAPTURE*
- *RELATIVE ABUNDANCE INDEX*

Canopy Camera Trap

Bird survey

FIELD DATA COLLECTION

- Notebooks (paper, pencil)
- Voice recorders
- PDA – Personal Data Asst.
- Smartphone App



CAMERA TRAPS
Photo-classification of “Raw Data”

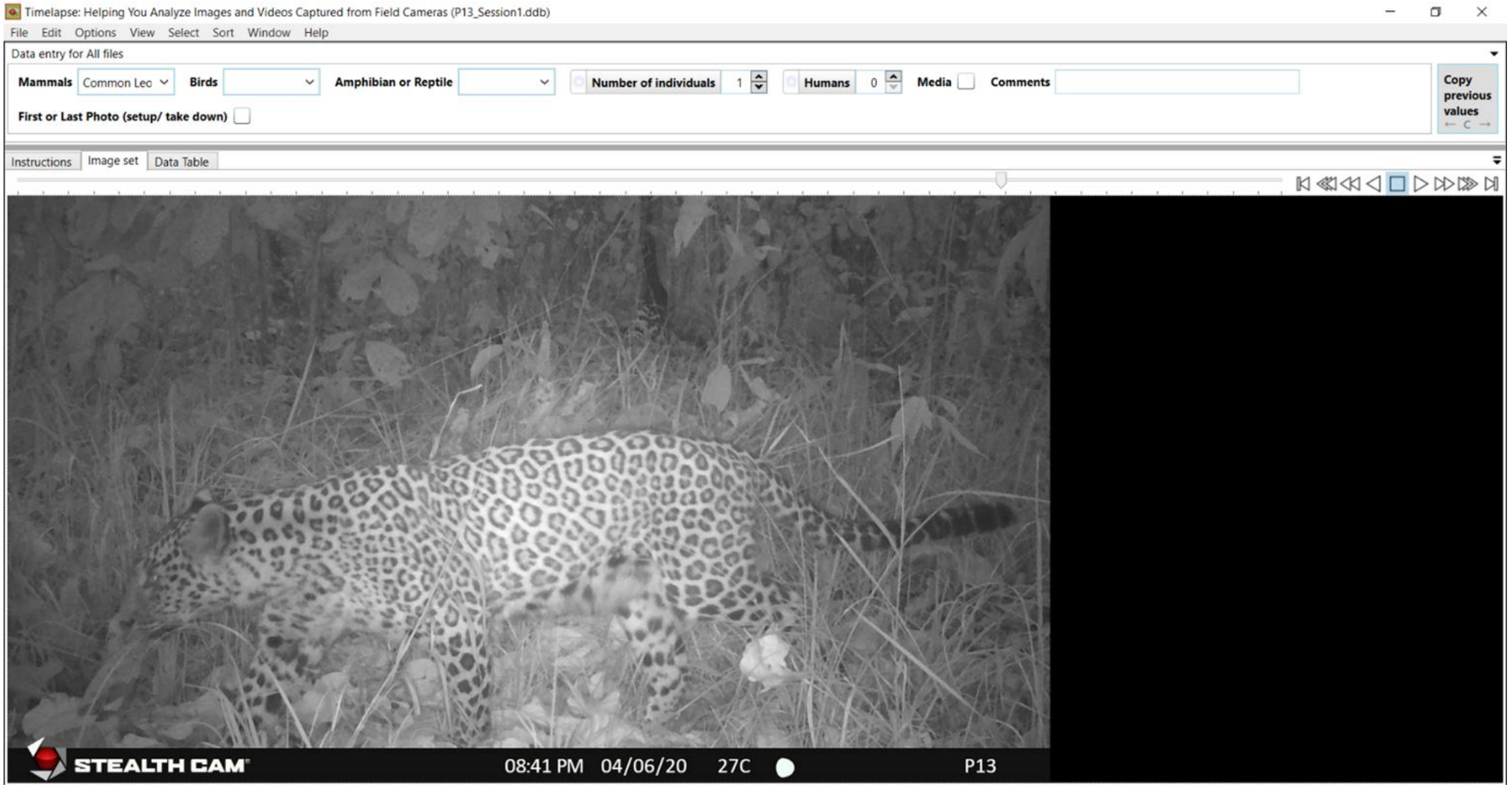


IMAGE CLASSIFICATION

Classified Data

	A	B	C	D	E	F	G	H	I	J
1	**ID**	**Camera#**	**Latitude**	**Longitude**	**Order**	**Family**	**Species**	**Date**	**Month**	**Season**
1796	9039	P14	301152	3016400	Cetartiodactyla	Cervidae	*Muntiacus muntjak*	2020-03-30	3	Dry
1797	9040	P14	301152	3016400	Cetartiodactyla	Cervidae	*Axis axis*	2020-03-30	3	Dry
1798	9041	P14	301152	3016400	Carnivora	Felidae	*Panthera tigris tigris*	2020-04-01	4	Dry
1799	9042	P14	301152	3016400	Cetartiodactyla	Suidae	*Sus scrofa*	2020-04-01	4	Dry
1800	9048	P14	301152	3016400	Carnivora	Felidae	*Felis chaus*	2020-04-03	4	Dry
1801	9049	P14	301152	3016400	Carnivora	Canidae	*Canis aureus*	2020-04-03	4	Dry
1802	9067	P14	301152	3016400	Cetartiodactyla	Suidae	*Sus scrofa*	2020-04-04	4	Dry
1803	9068	P14	301152	3016400	Carnivora	Felidae	*Panthera tigris tigris*	2020-04-04	4	Dry
1804	9069	P14	301152	3016400	Primates	Cercopithecidae	*Macaca mulatta*	2020-04-05	4	Dry
1805	9070	P14	301152	3016400	Primates	Cercopithecidae	*Macaca mulatta*	2020-04-05	4	Dry
1806	9071	P14	301152	3016400	Primates	Cercopithecidae	*Macaca mulatta*	2020-04-05	4	Dry
1807	9072	P14	301152	3016400	Carnivora	Felidae	*Panthera pardus*	2020-04-06	4	Dry
1808	9073	P14	301152	3016400	Cetartiodactyla	Bovidae	*Tetracerus quadricornis*	2020-04-06	4	Dry
1809	9102	P14a	301759	3016307	Cetartiodactyla	Suidae	*Sus scrofa*	2020-03-16	3	Dry
1810	9103	P14a	301759	3016307	Carnivora	Felidae	*Felis chaus*	2020-03-17	3	Dry
1811	9104	P14a	301759	3016307	Cetartiodactyla	Suidae	*Sus scrofa*	2020-03-18	3	Dry
1812	9105	P14a	301759	3016307	Cetartiodactyla	Cervidae	*Axis axis*	2020-03-18	3	Dry
1813	9106	P14a	301759	3016307	Cetartiodactyla	Cervidae	*Axis axis*	2020-03-18	3	Dry
1814	9107	P14a	301759	3016307	Cetartiodactyla	Cervidae	*Axis axis*	2020-03-18	3	Dry
1815	9108	P14a	301759	3016307	Cetartiodactyla	Cervidae	*Axis axis*	2020-03-18	3	Dry
1816	9109	P14a	301759	3016307	Cetartiodactyla	Suidae	*Sus scrofa*	2020-03-19	3	Dry
1817	9110	P14a	301759	3016307	Cetartiodactyla	Suidae	*Sus scrofa*	2020-03-19	3	Dry
1818	9111	P14a	301759	3016307	Cetartiodactyla	Cervidae	*Axis axis*	2020-03-20	3	Dry
1819	9112	P14a	301759	3016307	Carnivora	Felidae	*Panthera pardus*	2020-03-20	3	Dry
1820	9121	P14a	301759	3016307	Cetartiodactyla	Suidae	*Sus scrofa*	2020-03-21	3	Dry
1821	9130	P14a	301759	3016307	Cetartiodactyla	Suidae	*Sus scrofa*	2020-03-21	3	Dry

Sheet1

OUTPUTS

Results of field data collection

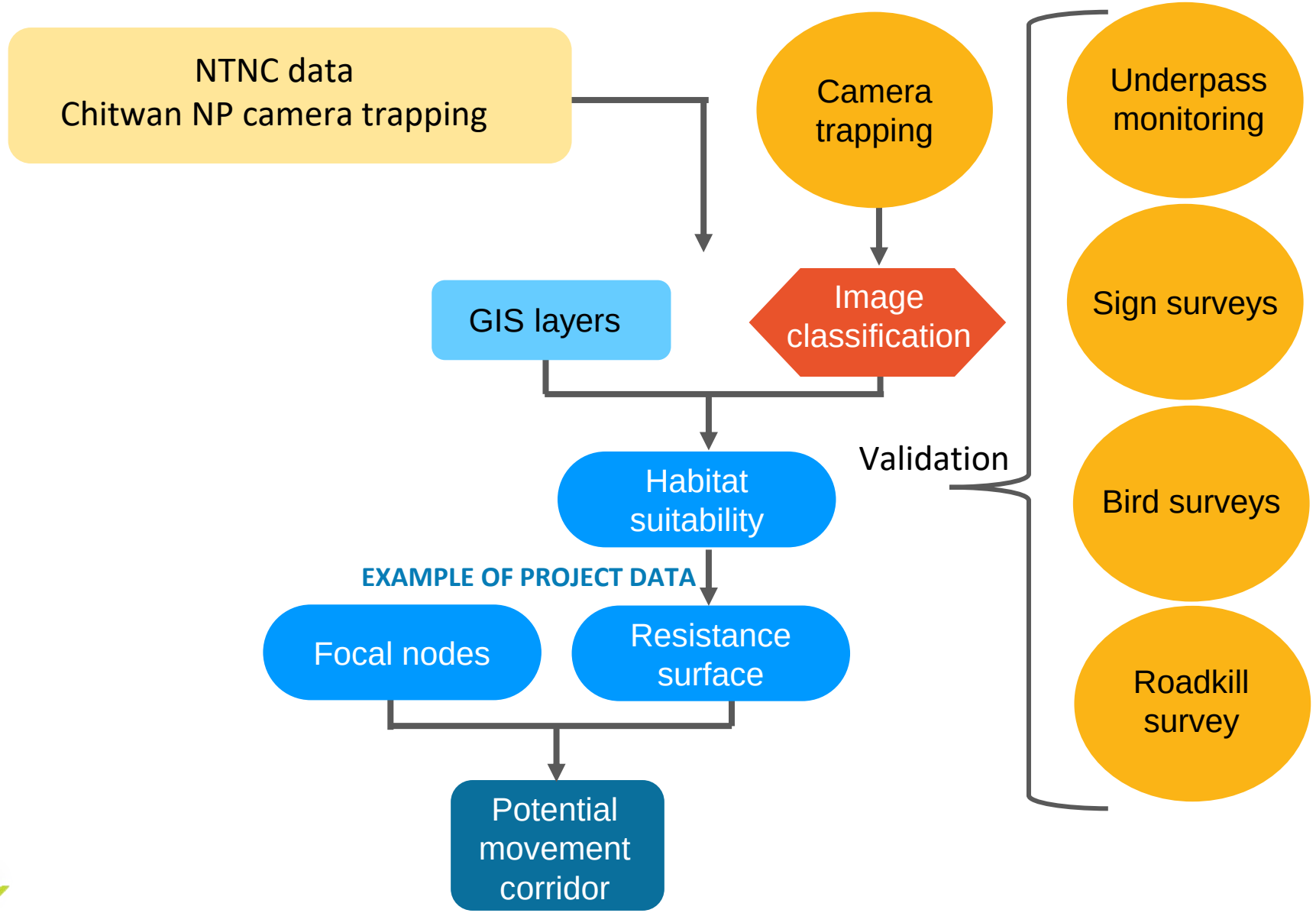
Road-kill hot spots/clusters

- Species occurrence,
  Location, Severity of impact

Species Occurrence
(Camera/Sign surveys)

- Distribution, Corridors,
  Modelling Connectivity

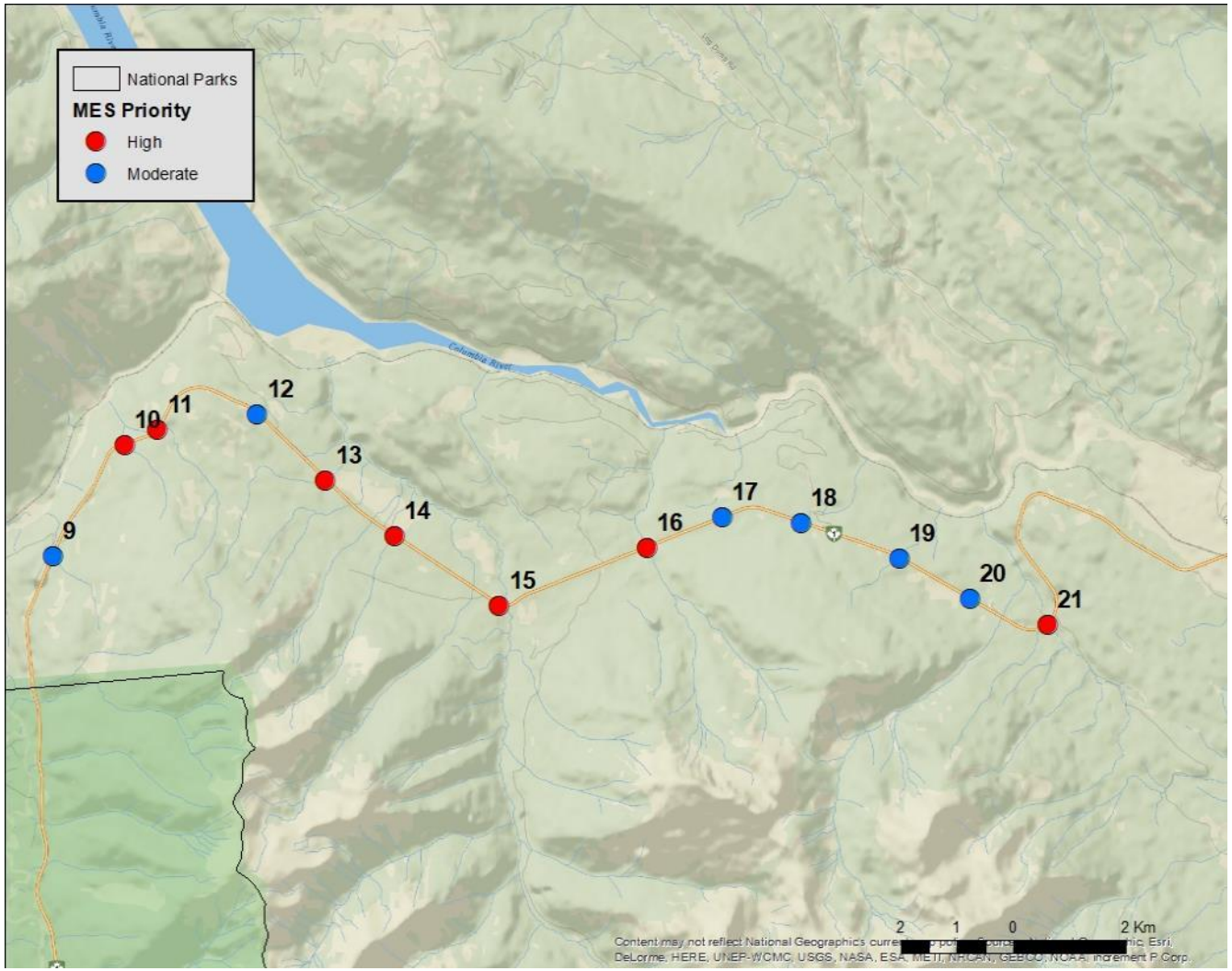
EXAMPLE OF PROJECT DATA



MERGING AND SYNTHESIS

Locations (“candidate”)

1. **Locations**
2. Prioritization of sites



MERGING AND SYNTHESIS

Prioritization of locations

Primary - Secondary - Tertiary

Criteria:

Critical Species Needs & Ecosystem Conservation

“Layering” of Mitigation Recommendations

1. *Large/Iconic species (Conservation Concern)*
2. *Arboreal/Canopy-dwellers*
3. *Small/Medium Terrestrial Vertebrates*

CASE STUDIES

BHUTAN – *Road Project*

- NH 2, NH5, Phipsoo Wildlife Sanctuary

BANGLADESH - *Railway Project*

- Chittagong – Cox's Bazar

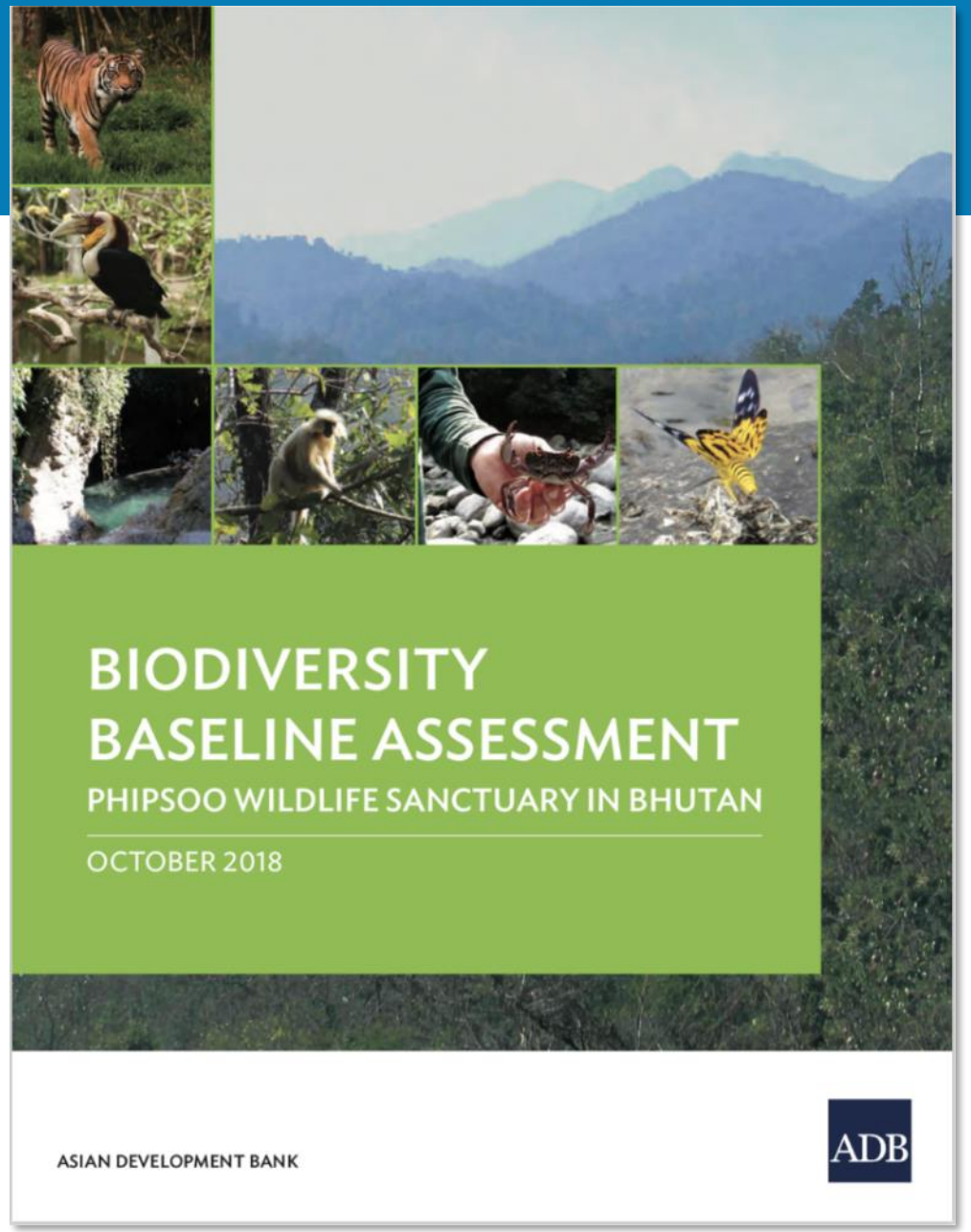
CASE STUDY

BHUTAN

Road Network Project II

NH 2 & NH5

Phipsoo Wildlife Sanctuary



CASE STUDIES

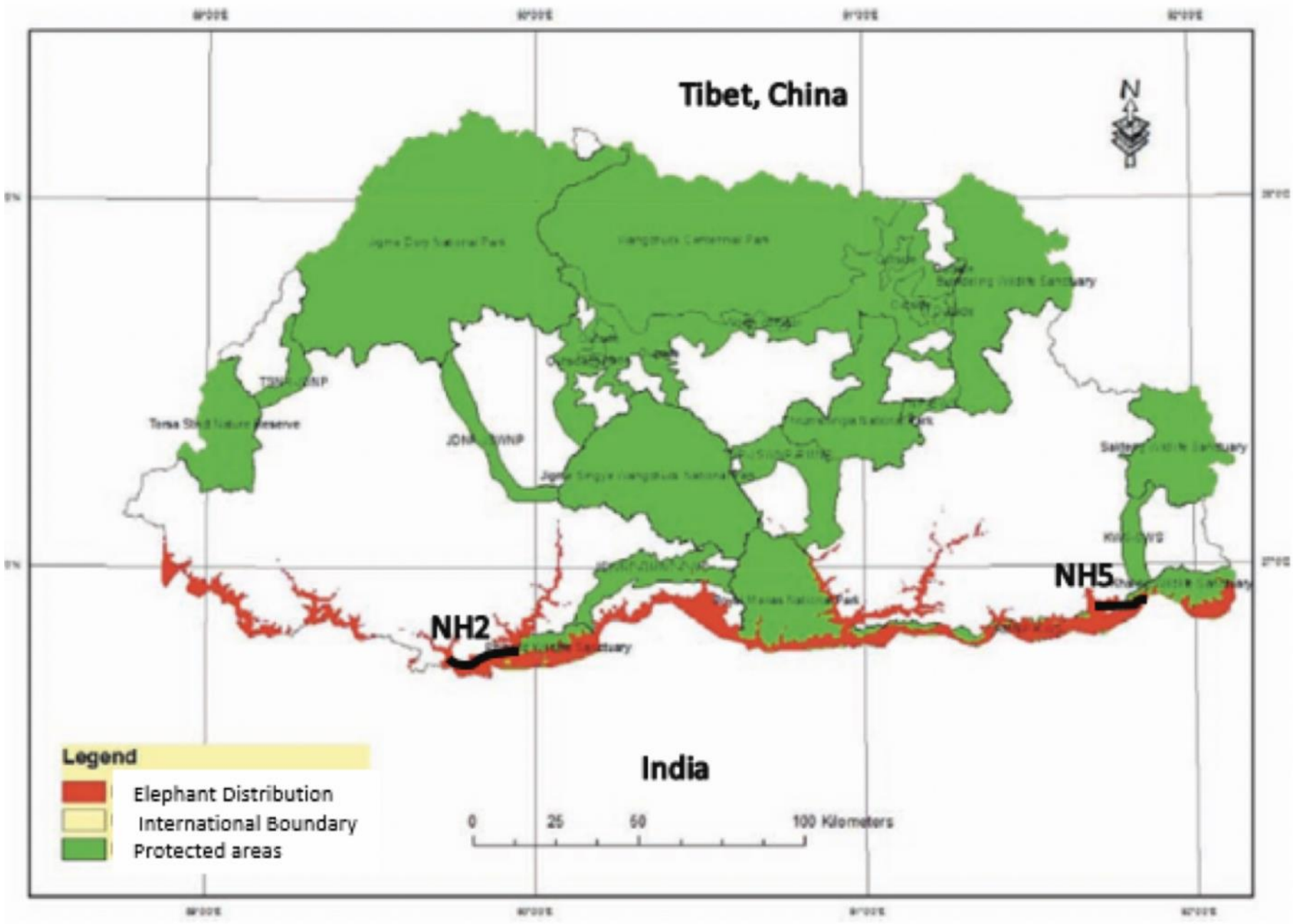
BACKGROUND

Bhutan

- Mountainous country with high biodiversity
- 52% of country in Protected Areas
- Road Network Project II (East-West Highway)

<u>Southern Bhutan road projects</u>:

- NH2 and NH 5
- NH2 within Phipsoo Wildlife Sanctuary



Source: (Jigme & William, 2011)

CASE STUDY Bhutan

- EIA conducted: NH 2 & NH5 road projects:

  Wildlife Crossings recommended

  - BBA for Phipsoo Wildlife Sanctuary (2014-15)

    1st BBA in Bhutan

    - Surveys in 4 zones

      Border lowlands to upper foothills

      Terrain, elevation, vegetation differences

CASE STUDY Bhutan

BBA Design

- Desktop screening of IUCN listed species
- Camera trapping
- Forest vegetation inventory
- Avian surveys

SURVEY: 33 sites (6 months)

- 4300 mammal images
- 27 species, 15 species IUCN-listed (2 Critically End.)

CASE STUDY Bhutan

BBA – LESSONS LEARNED

2 segments pass through critical habitat (ADB non-compliant)

Biodiversity values

- Highest in Core; Lowest on Border
- Re-alignment recommended (Avoidance, no net loss)

Expert input

- national and international specialists

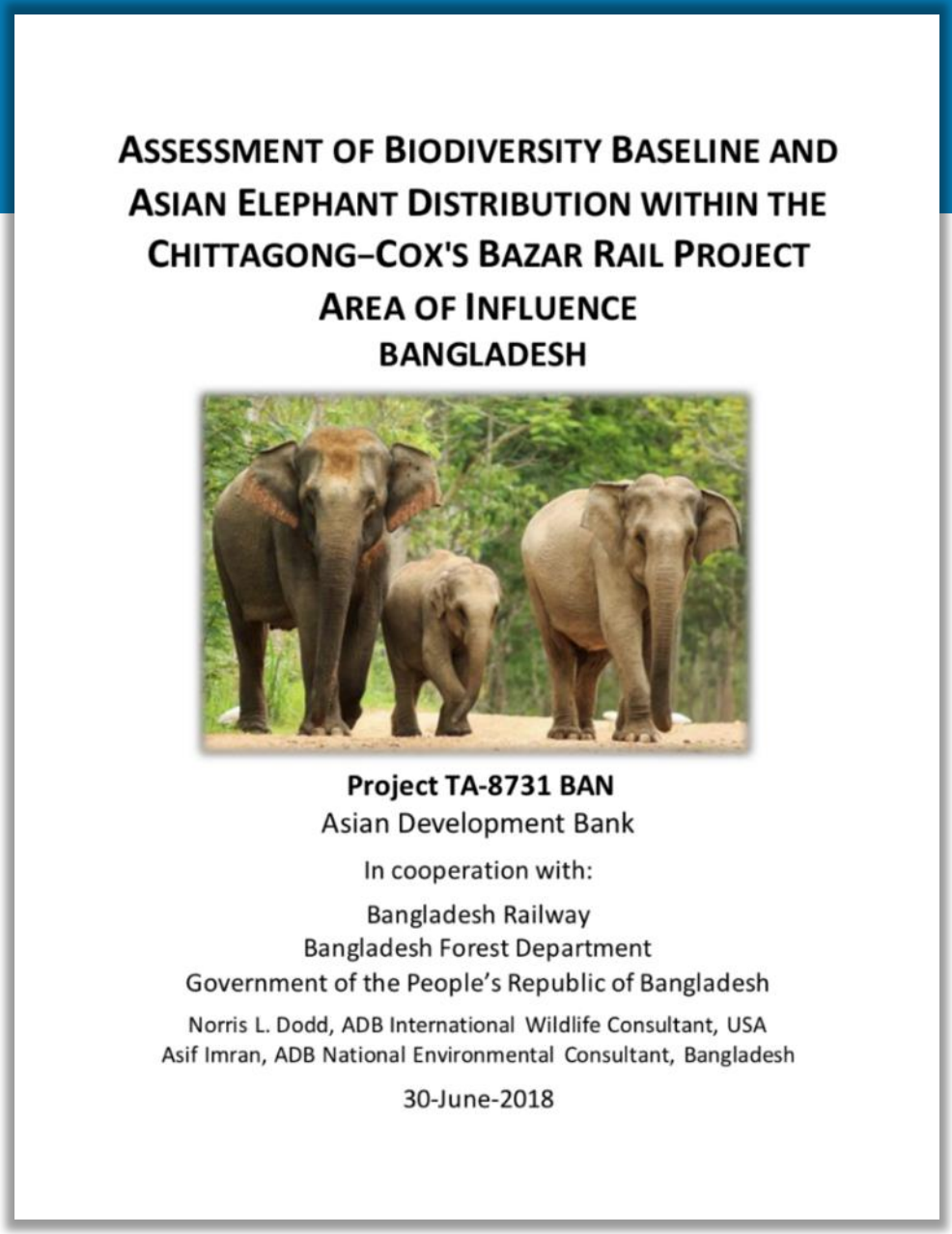
Road construction cancelled:

- Security and safety issues along Indian border

CASE STUDY

BANGLADESH

Chittagong – Cox’s Bazar Railway



ASSESSMENT OF BIODIVERSITY BASELINE AND ASIAN ELEPHANT DISTRIBUTION WITHIN THE CHITTAGONG–COX'S BAZAR RAIL PROJECT AREA OF INFLUENCE BANGLADESH

Project TA-8731 BAN
Asian Development Bank

In cooperation with:

Bangladesh Railway
Bangladesh Forest Department
Government of the People’s Republic of Bangladesh

Norris L. Dodd, ADB International Wildlife Consultant, USA
Asif Imran, ADB National Environmental Consultant, Bangladesh

30-June-2018

CASE STUDIES

BACKGROUND

- 3 Protected Areas impacted
- Asian Elephants present
- “Category A” project

BBA

Conducted in 3 PAs

Camera, Sign, Avian, Forest

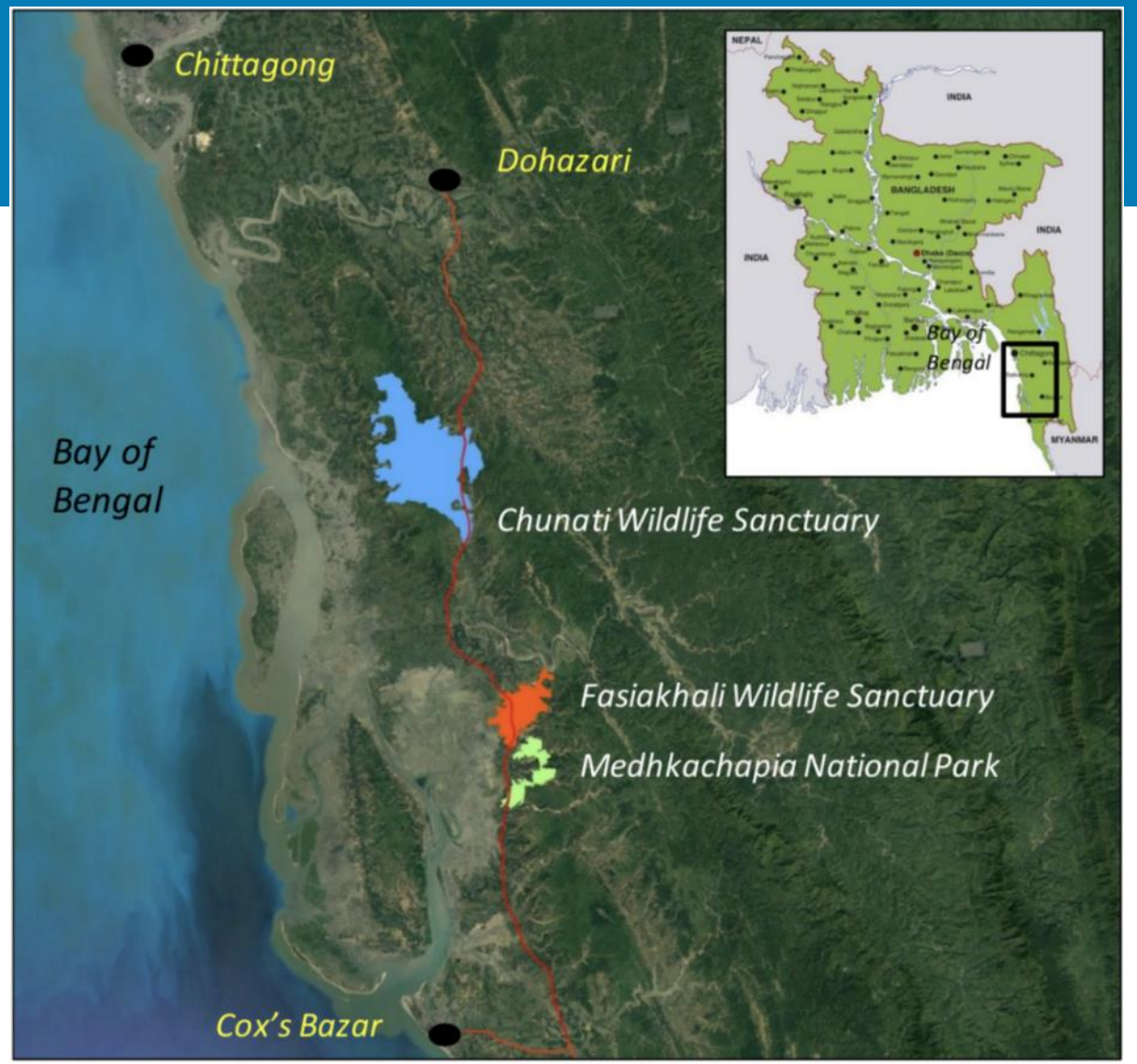


Figure II-1. The Chittagong-Cox's Bazar Railway Project alignment (red line) in southeastern Bangladesh which crosses through the Chunati (blue) and Fasiakhali (orange) wildlife sanctuaries and Medhkachapia National Park (green). Also shown are the locations of Chittagong and the Project termini at Dohazari and Cox's Bazar.

CASE STUDY Bangladesh

Recommendations*

- CWS – 2 wildlife overpasses
- FWS – Fencing at elephant crossings near crops
- MNP – Fencing and detection system at ends

*Data-informed recommendations

Diverse Strategy: Corridors, Collisions and Conflicts!

CASE STUDY Bangladesh

Lessons Learned

- Complex project
- Full year BBA data collection
- Local, national and international experts
- Field data and surveys
- Expert input

CHALLENGES

1. FIELD DATA COLLECTION
2. DATA STORAGE
3. DATA MAINTENANCE/QUALITY CONTROL CHECKS
4. DATA SUMMARIES & DISPLAY (GIS interface, maps)
5. DATA SHARING :

Client/Proponent, Project Team, the World !

CHALLENGES

TRADITIONAL METHODS

- Hard Drive Storage

  One person, one team

- Software

  XLS, Camera trap, Statistical, GIS, Website, …

TODAY

"The Modern Road Ecologist's Toolbox"

MODERN TOOLS FOR MODERN CONSERVATION APPLICATIONS

Interface ALL !

Data Platform

Software as an Service (SAAS):

- Open source data
- High resolution