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MODULE 2

# Managing and Analyzing Biodiversity Data

ADB

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

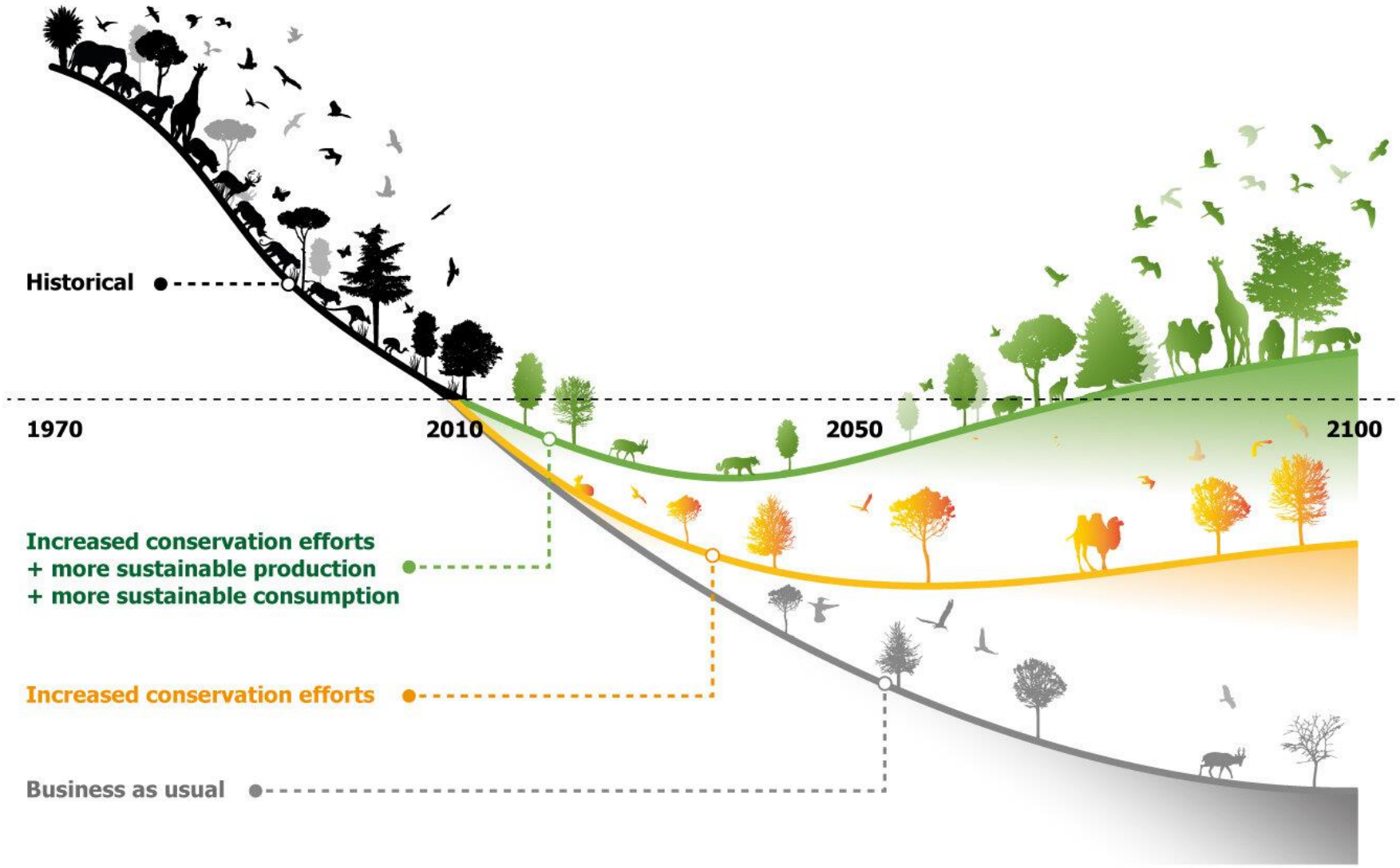
The Modern Road Ecologist's Toolbox

## Module 2:
# Managing and Analyzing Biodiversity Data

A. Example BBA IN NEPAL
B. Demo Nepal apps and DB
C. TOOLS AND BEST PRACTICIES FOR COLLECTING DATA
D. DEMONSTRATIONS: DATA COLLECTION TOOLS & DASHBOARDS

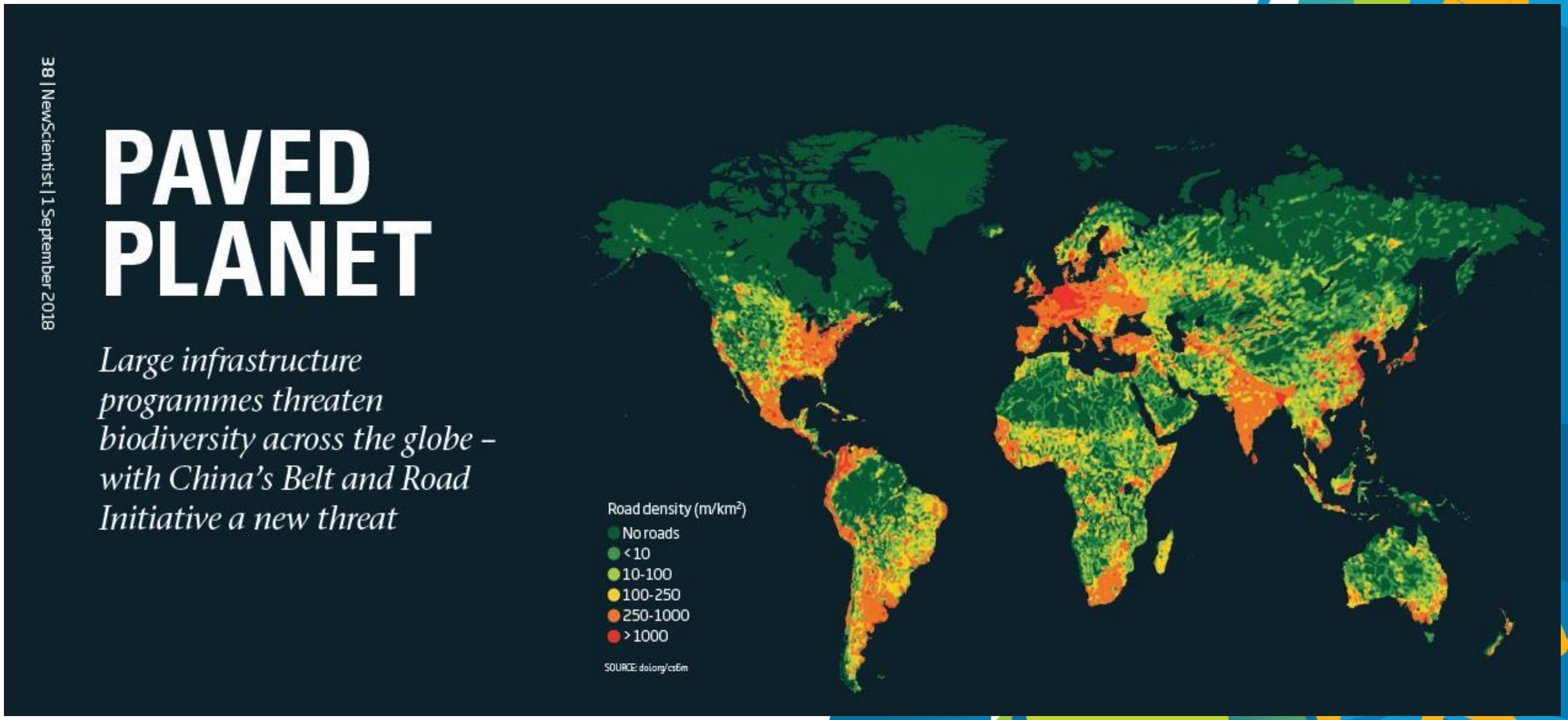
# Biodiversity is declining across the globe at an unprecedented rate

*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)

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



# Narayanghat-Hetauda-Pathlaiya (NHP)

*Smart Infrastructure Planning and Design to Protect Natural Habitats and Biodiversity (TA-9461)*

# BACKGROUND

## SASEC Road Improvement Project

**Funders:** Govt Nepal, ADB

**Location:** Terai Arc NEPAL

**Roads:** **NB:** Narayanghat-Butwal (*115 km*)

**NHP:** Narayanghat-Hetauda-Pathlaiya (Mahendra Highway - *108 km*)

**Status:** NB in construction; BA/EIA completed

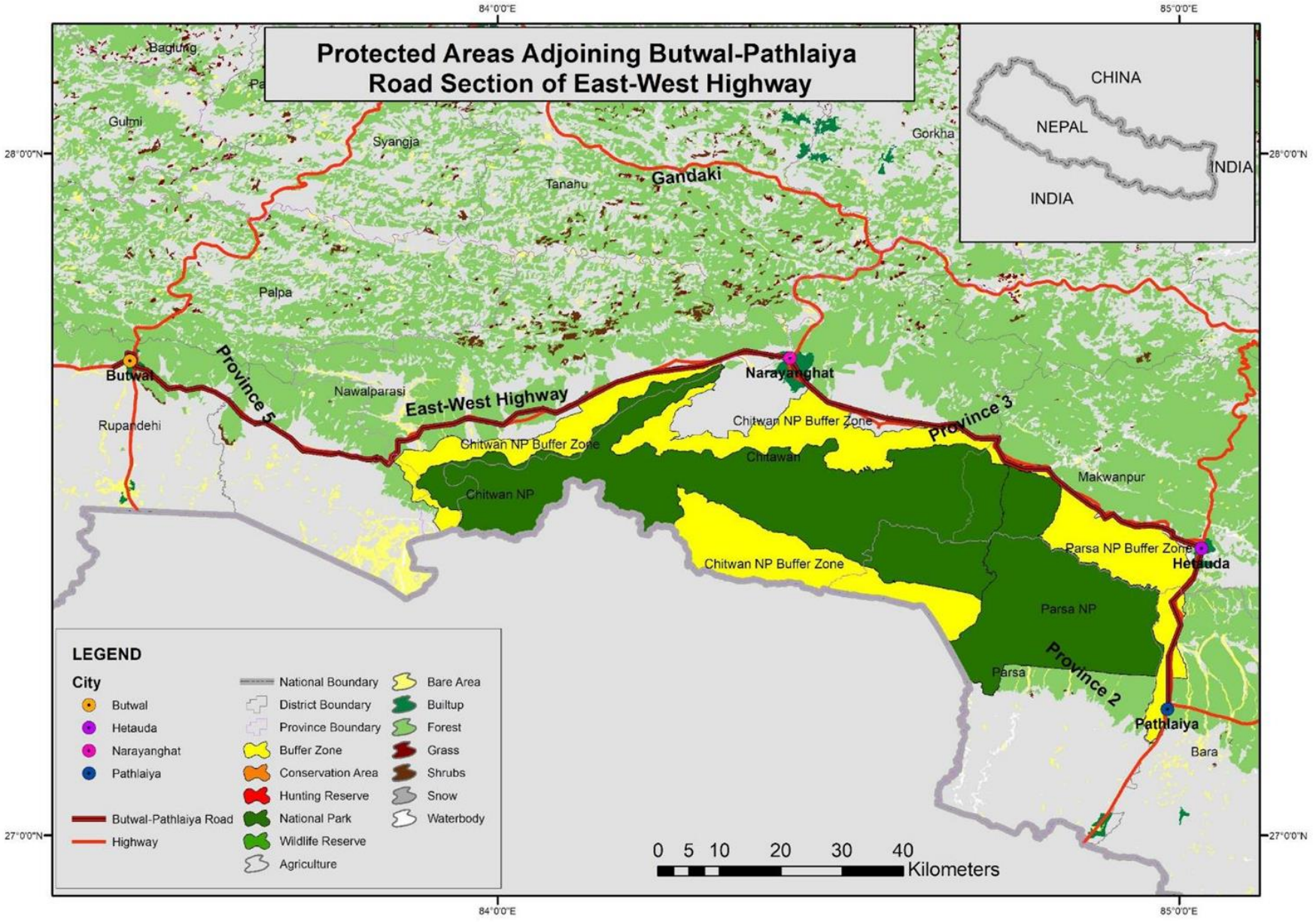
**NHP BBA in progress; Nov 2021**

# SASEC Road Improvement Project Objectives

Upgrading from 2 to 4 lanes
Adjacent to buffer zone
Chitwan NP

# “CATEGORY A”

Narayanghat – Hetauda – Pathlaiya (NHP) - 108 km



# OBJECTIVES

1. “To conduct comprehensive and in-depth ecological studies in and around the project area for the NHP road.”
2. “Provide technical support and guidance for design and implementation of the wildlife mitigation measures and biodiversity conservation plan”

## What are the impacts ??

*Increased traffic, disturbance…*

## Effects:

*mortality,movements/connectivity*

# TEAM AND OBJECTIVES

***TA 9461 - Smart Infrastructure planning and design to protect natural habitats and biodiversity***

- NEPAL (Jade Consult, Kathmandu)
- INTERNATIONAL/CANADA (ESSA Technologies, Vancouver)

## BBA Objectives

*Enhance the sustainability of its investments by integrating measures to protect natural habitats and biodiversity.*

- Biodiversity
- Bio-engineering
- CEA – Climate change
- Natural Capital
- Training & Knowledge Product

# OBJECTIVES OF NHP PROJECT

*What data do we need to collect ?*
*What are the impacts ??*

## MORTALITY

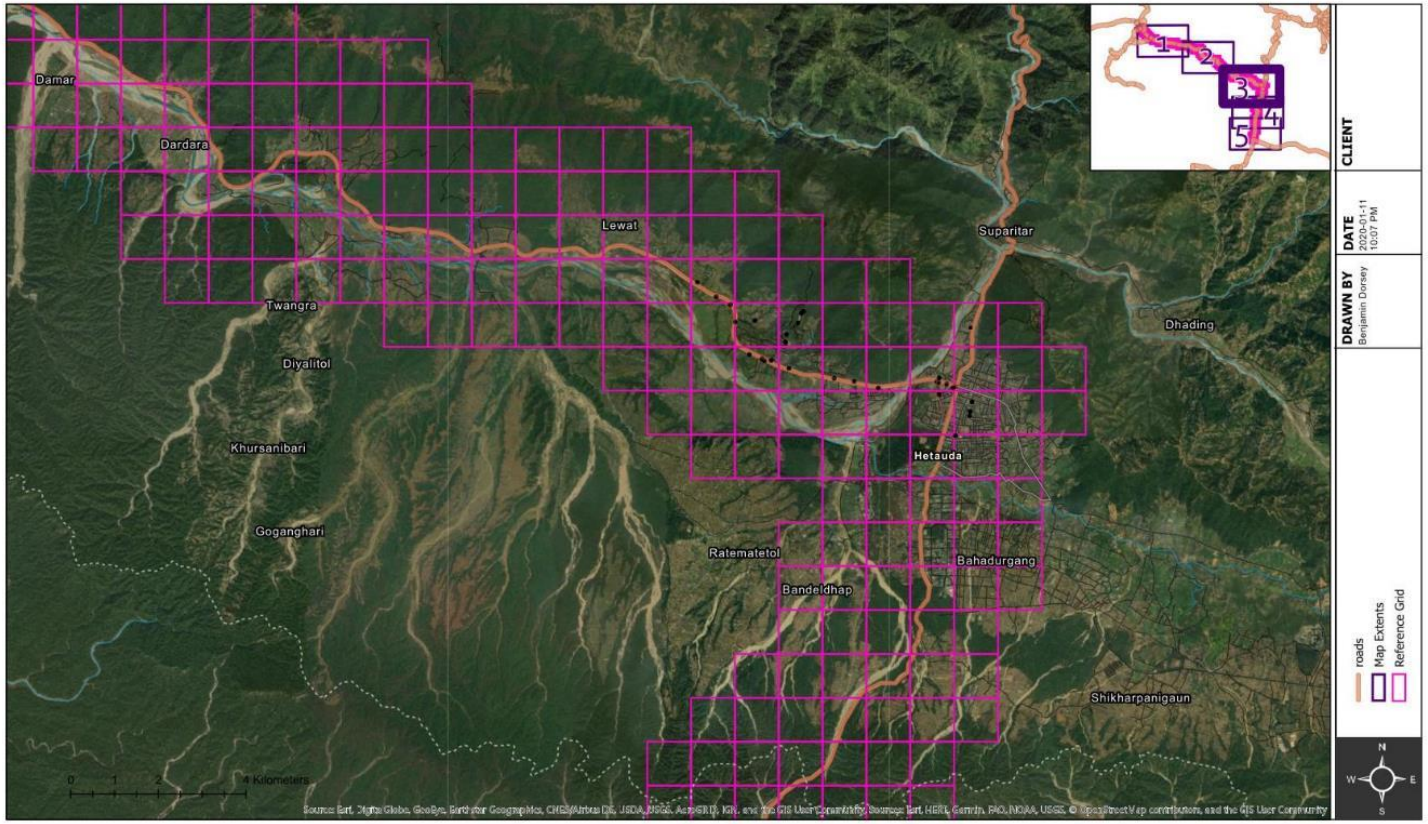
- From vehicles

## MOVEMENT

- Habitat Connectivity

*What species ??*

NHP Road Field Map - Draft



# Informed study design & data collection

- *Umbrella Species ??*
- *Big charismatic species ?*
- *Multi-taxon ??*
- *Can we use all the species data ??*

  » *Niche characteristics**

  *see: Animal Conservation 19:251 (2016)

# FOCAL TAXA CATEGORIES

1. Species of Conservation Concern

   IUCN Listed:

   Tiger, Rhino, Elephant, Leopard, Sloth Bear etc.

2. Arboreal/Canopy-dwelling species

   Terai Grey Langur

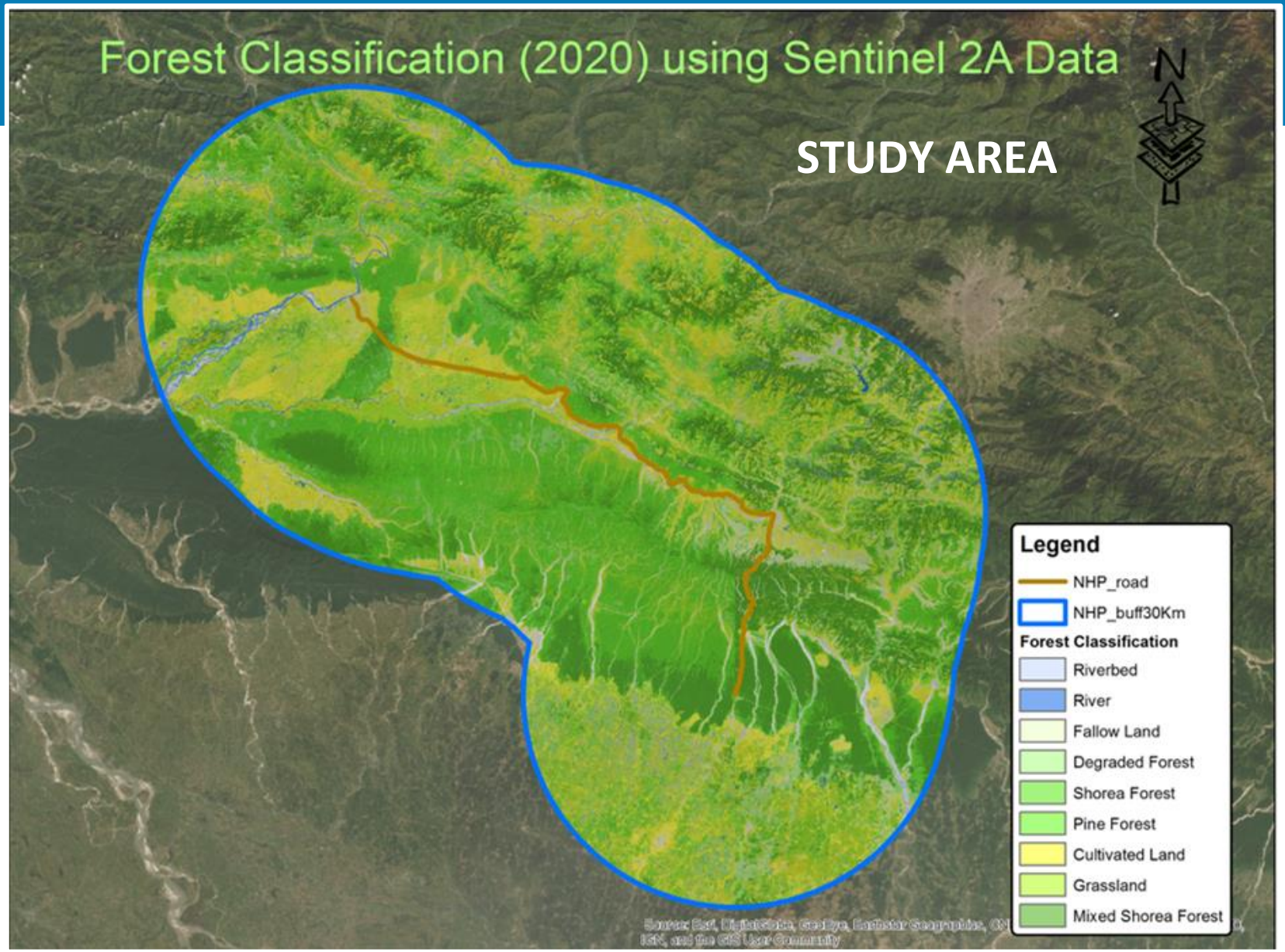
3. Small/Med-sized Vertebrates

   Hispid hare, Leopard cat, Yellow-throated marten etc.

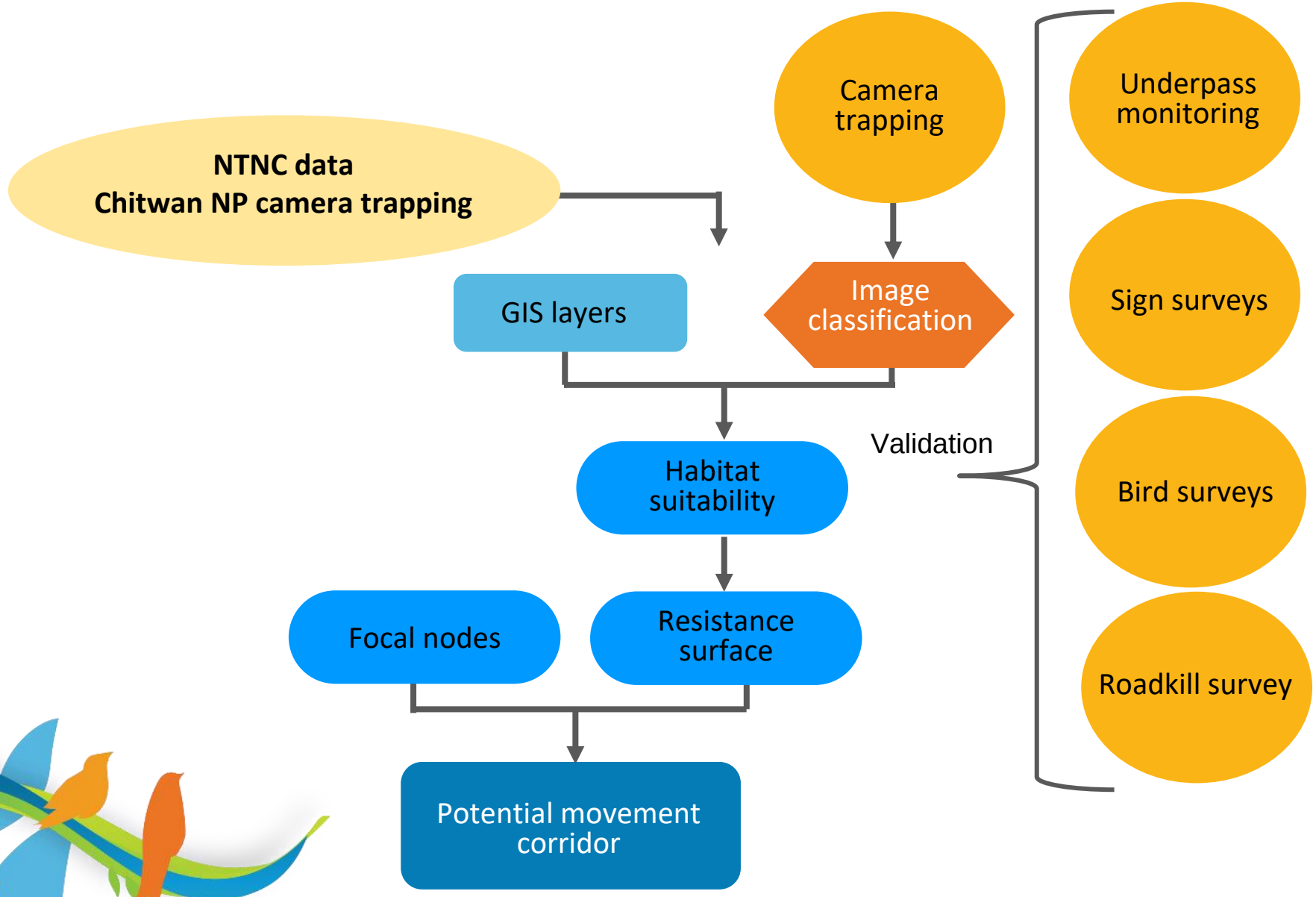
# MERGING AND SYNTHESIS

## WHERE TO BEGIN?

Study area & design

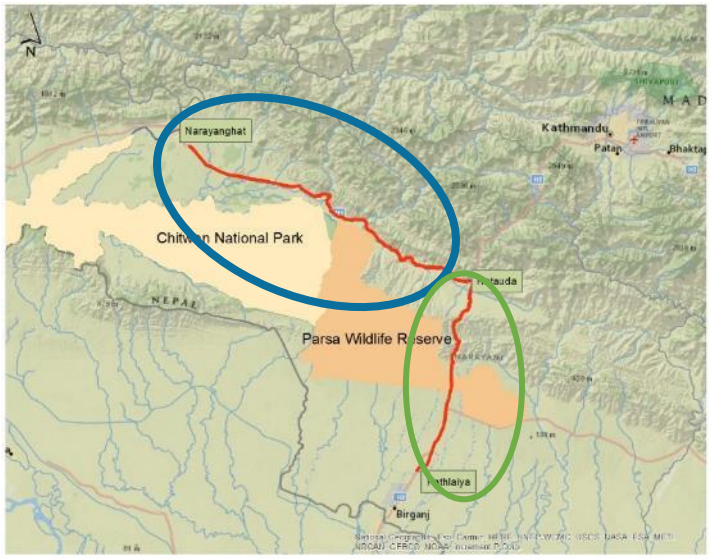


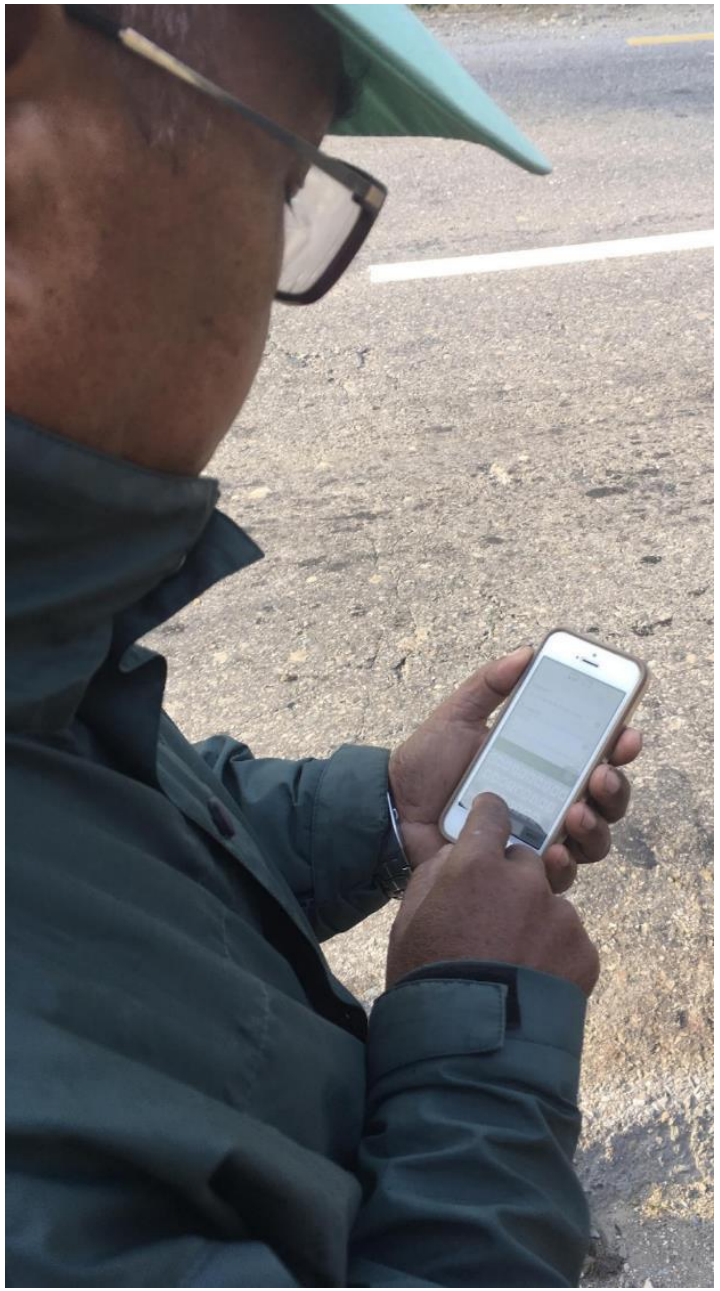
# PROJECT DATA & PROCESS



# Roadkill survey

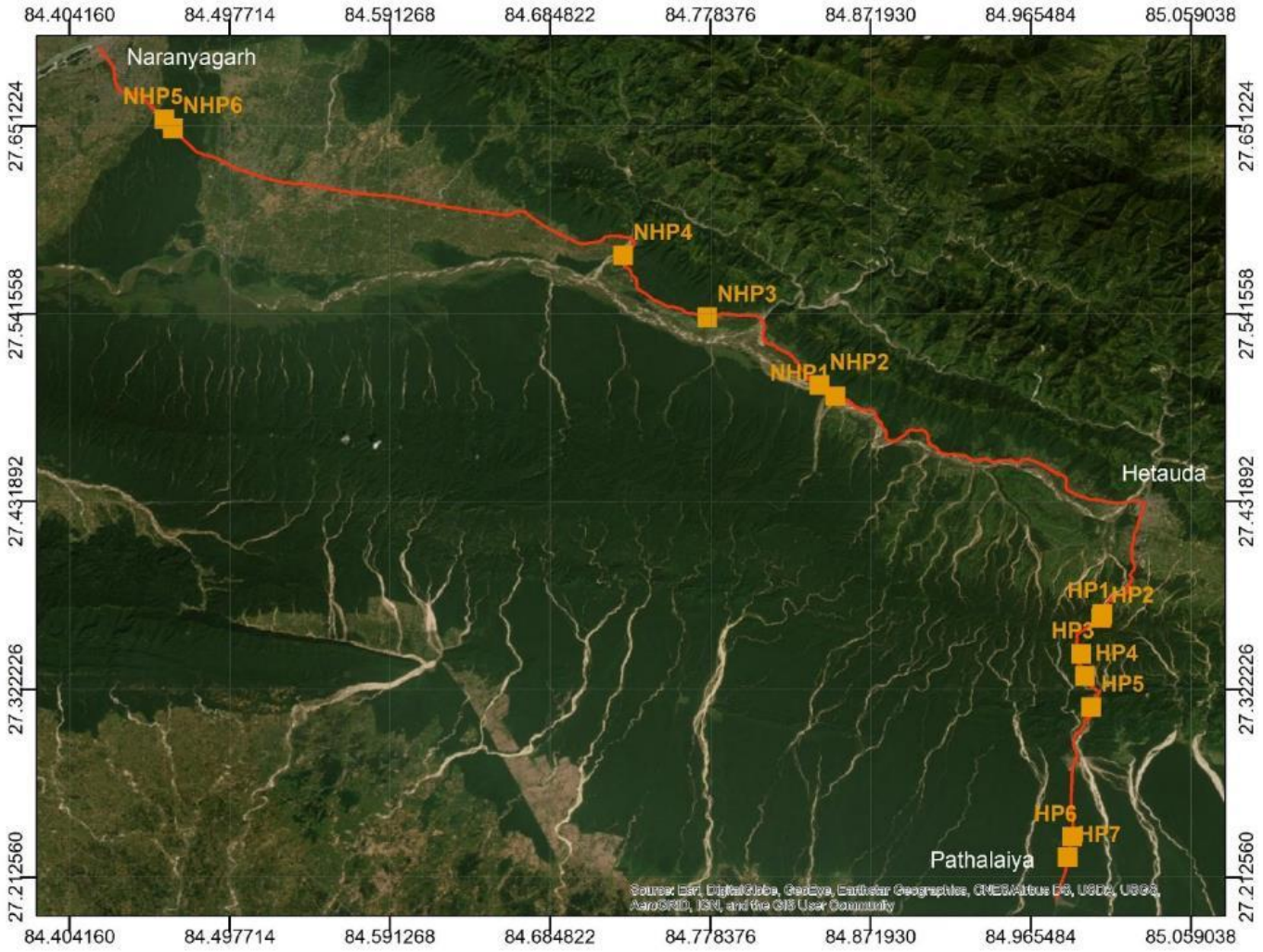
5 times / week
**2 field Crews**
Rdkill/Live Observ
Local knowledge



# Underpass Monitoring

Another track ??

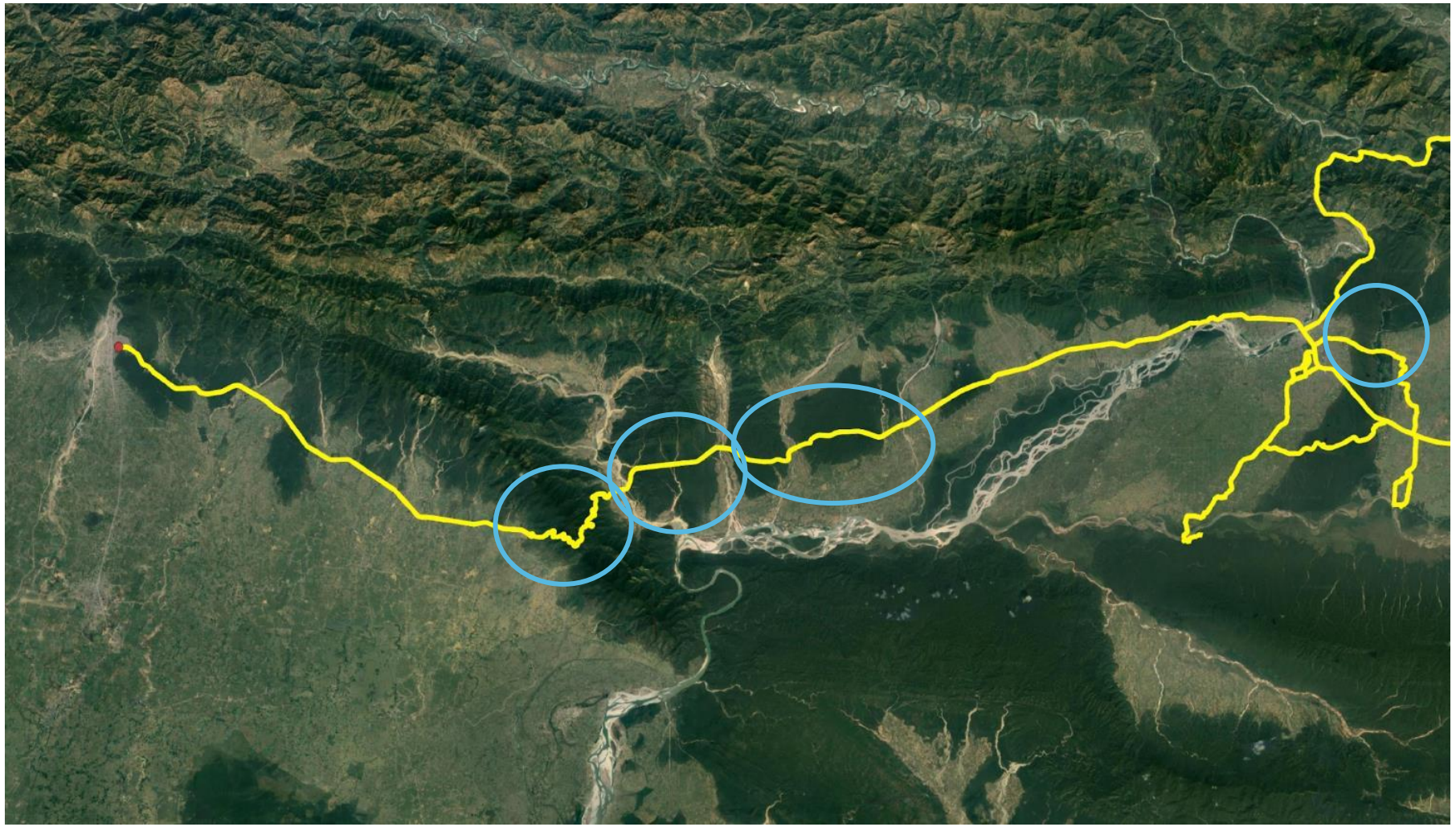



Existing Underpasses

**Camera/Sign Surveys**

# Intact and Connected Forest/Habitat

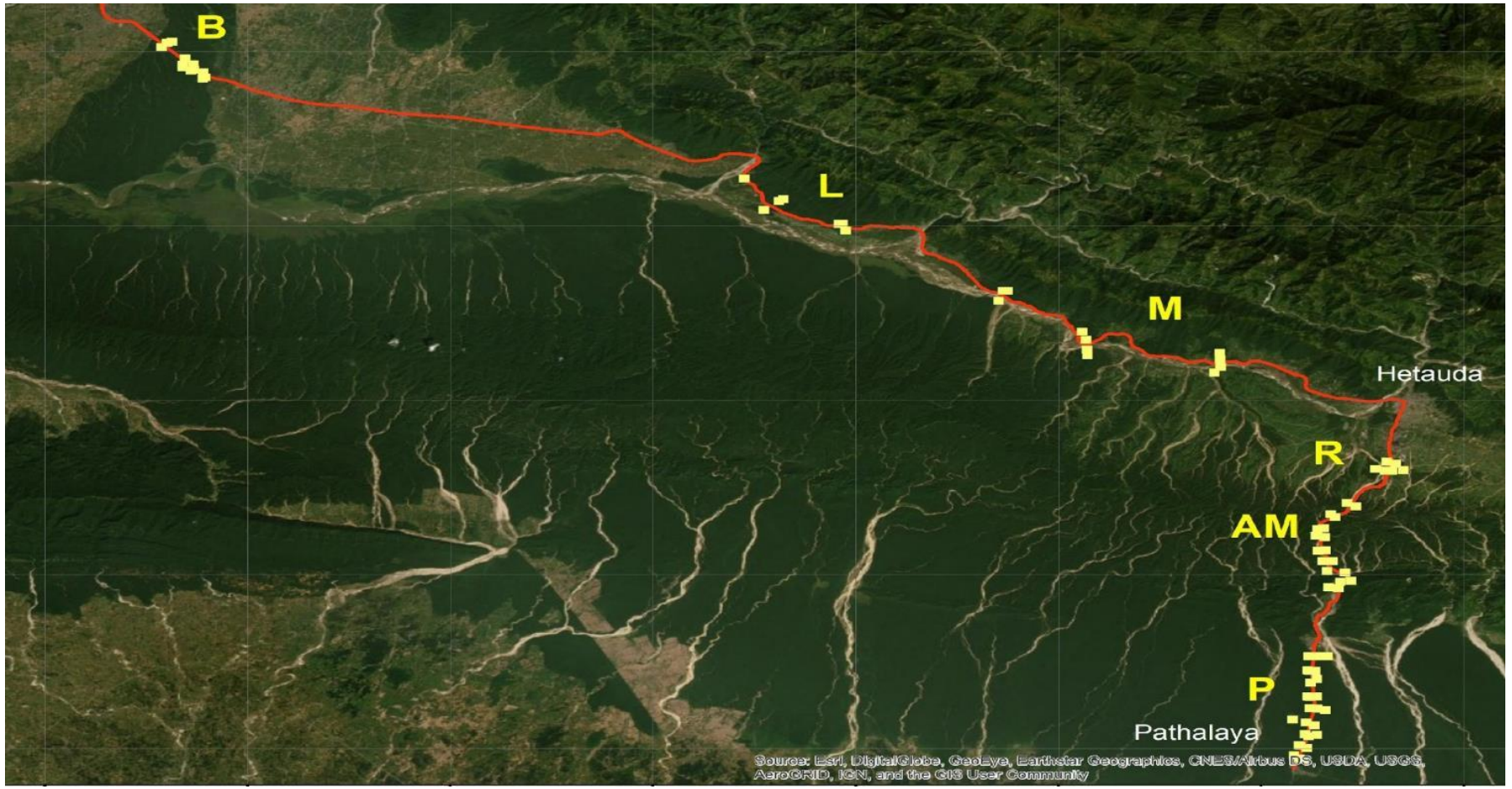
"Critical Linkages"



**Camera/Sign Surveys**

# Intact and Connected Forest/Habitat

"Critical Linkages"

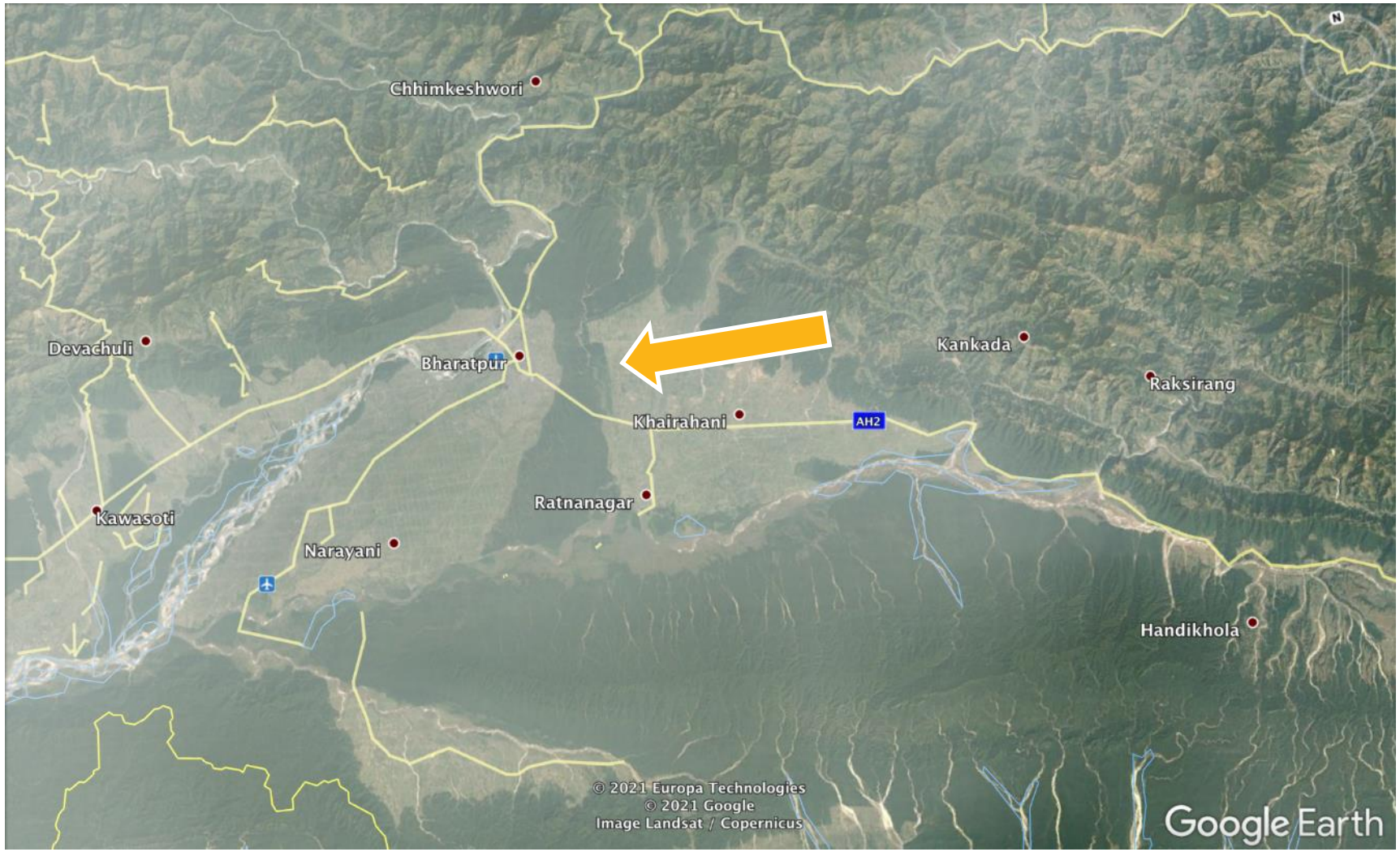


**Camera/Sign Surveys**

# Barandabhar Corridor

## Intact and Connected Forest/Habitat

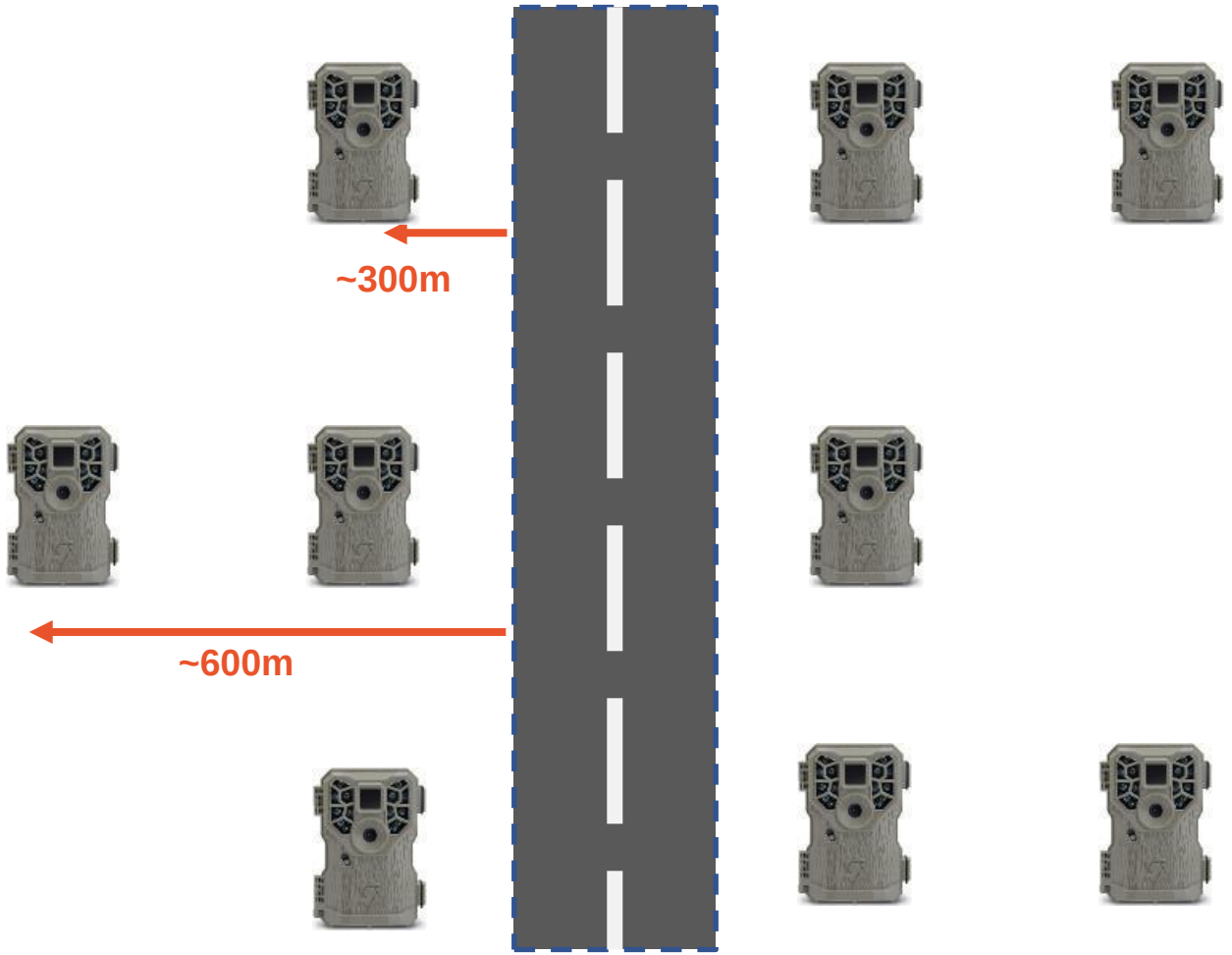
"Critical Linkages"



# Camera/Sign Surveys

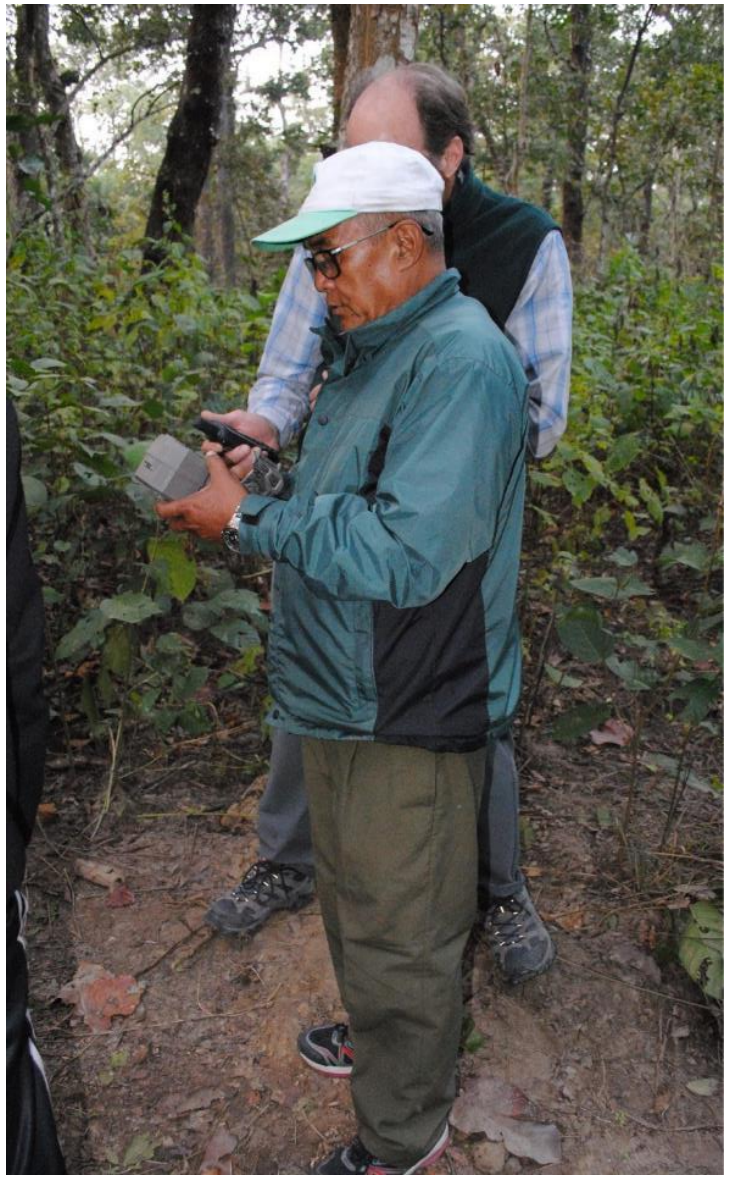
## Camera trapping

| | |
|---|---|
| **SEASON**<br>Monsoon<br>Dry | **# SITES**<br>82 |
| **# CAMERAS**<br>20 | **SURVEY PERIOD**<br>20 days |



## Camera Traps

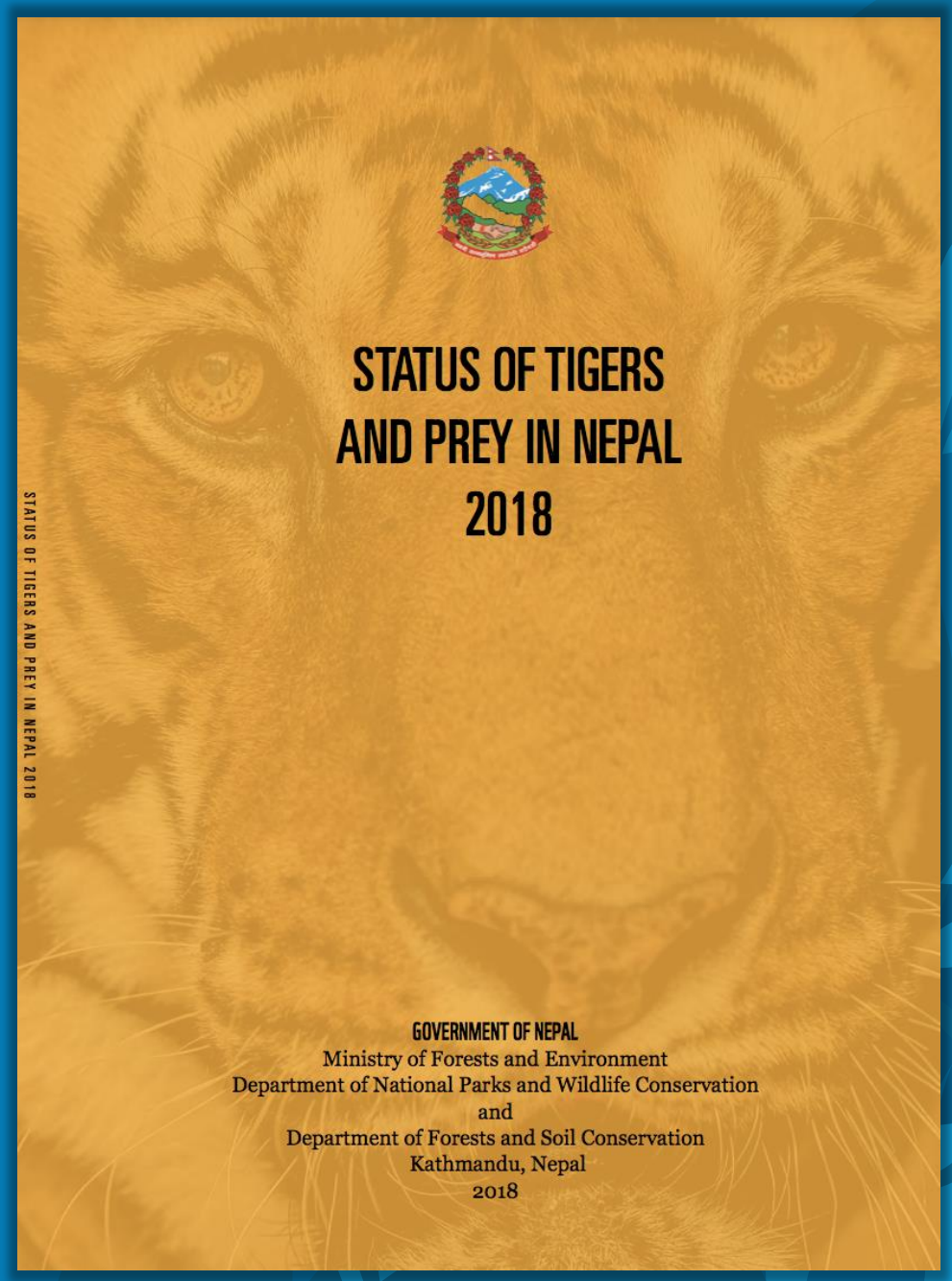
- *Set-up*
- *Programming*
- *Training*



# National Tiger Census

NTNC data
Chitwan NP camera trapping

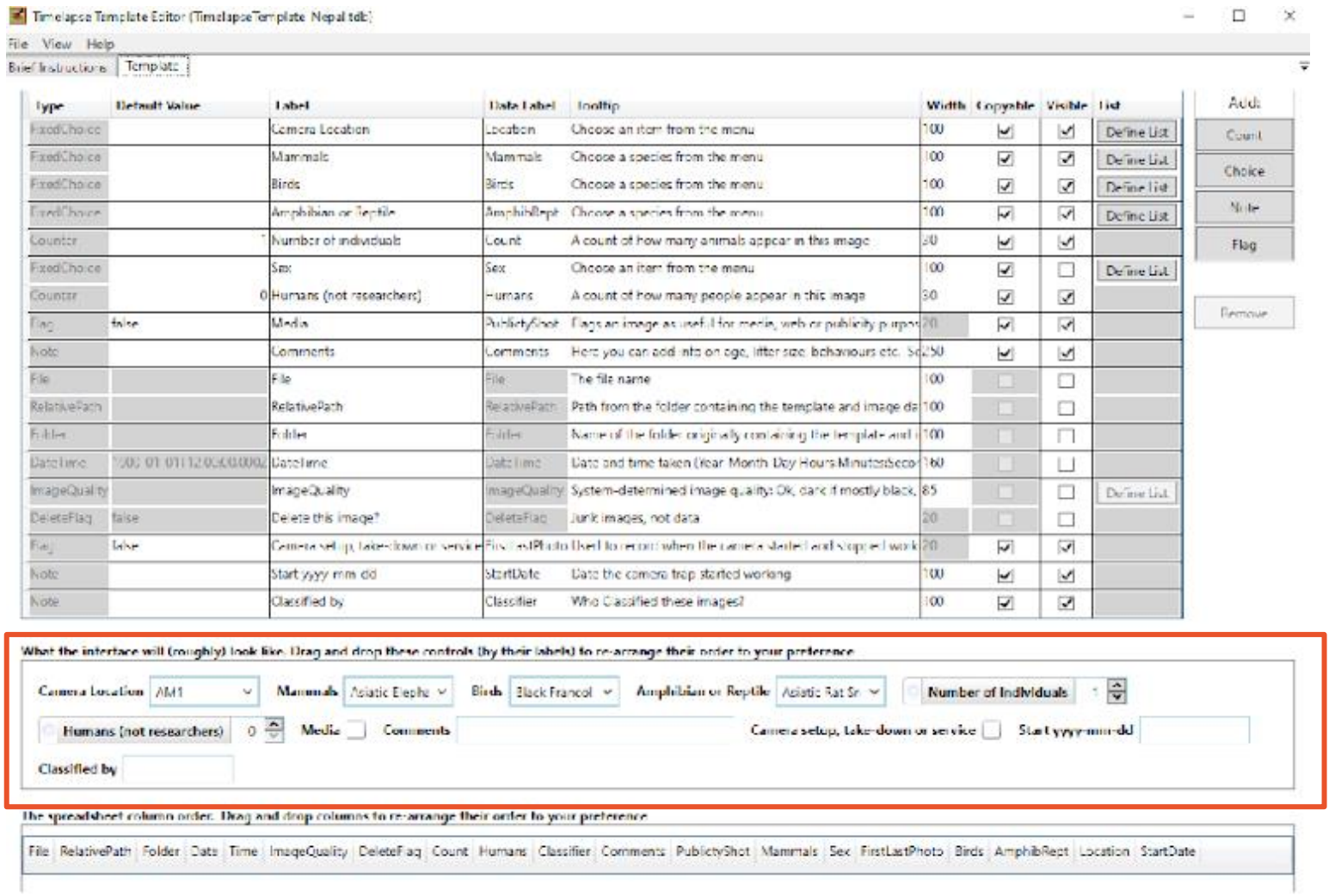
2.5x2.5 km cells – NPs
15x15 km cells outside NPs



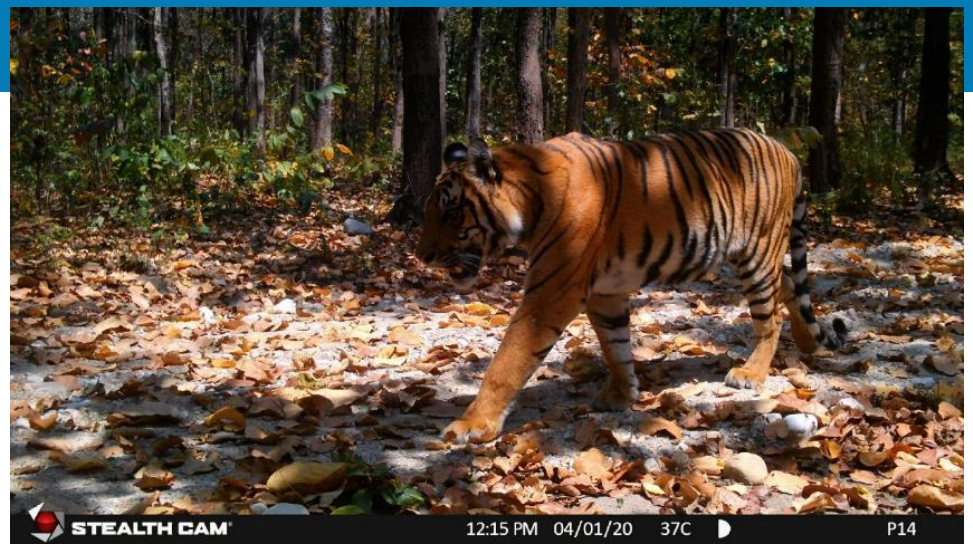
# What to do with all these photographs ??

Image classification

**TIMELAPSE**



# Image classification - The Unexpected !



Honey Badger

Crab-eating fox

# Be adaptable to changing environment

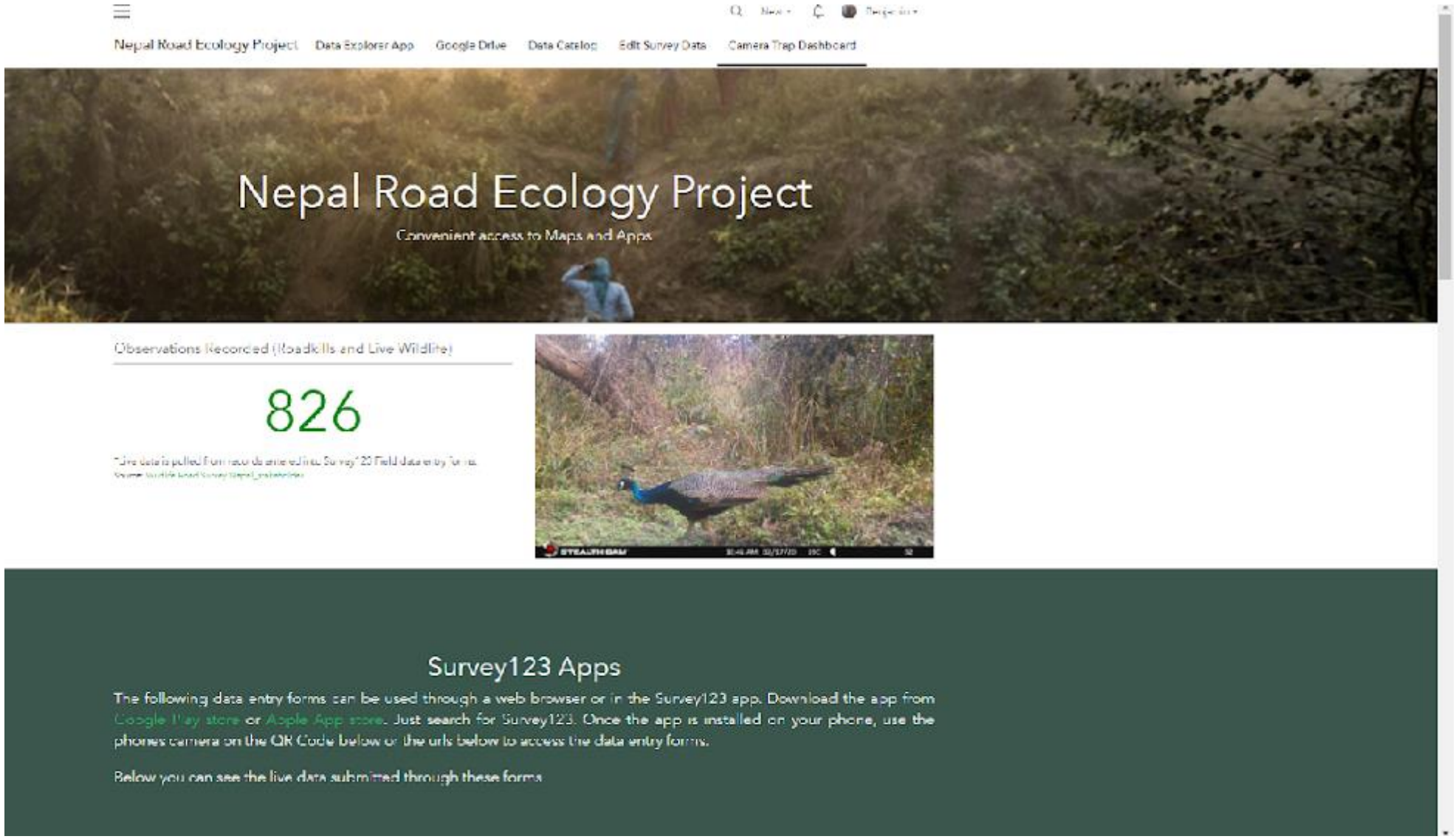
(political, social, pandemics, weather… ) **THE BEST INTENTIONS …….**

| Survey | Status |
|---|---|
| Roadkill/live observations | These surveys are completed (Dec 2019 – Jan 2021). There was a total of 51 road-kill records and 66 sightings of next to road animals. 13 animals were observed crossing the road. |
| Local observations/ knowledge | Data were not collected due to Covid-19 Lockdown. |
| Camera/sign surveys | Camera surveys are completed. Photo-classification is taking place and will be completed by April 2021. |
| Bird surveys | Bird surveys are completed. Data are being input to spreadsheet and not ready for summary. |
| Underpass monitoring | Completed. Few data are available for use in the study. |

# BONUS!

NTNC camera trap and photo-classification from the National Tiger Survey

| Scientific Name | Species | Nepali Name | Conservation Status | | | | Habitats | Number of photos |
|---|---|---|---|---|---|---|---|---|
| | | | CITES | IUCN | NRDB | NPWC Act | | |
| *Cuon alpinus* | Asiatic Wild Dog | Dhole, Ban Kukur | II | EN | VU | | Forest | 27 |
| *Vulpes bengalensis* | Bengal Fox | Phusro Phyuro | | LC | SU | | Forest | 5 |
| *Canis aureus* | Golden Jackal | Syal | | LC | | | Forest fringe, open areas | 324 |
| *Panthera pardus* | Common Leopard | Chituwa | I | NT | SU | | Forest | 199 |
| *Felis chaus* | Jungle Cat | Ban Biralo | | LC | SU | | Forest fringe | 227 |
| *Felis bengalensis* | Leopard Cat | Chari Bagh | II | LC | VU | P | Forest | 158 |
| *Panthera tigris tigris* | Royal Bengal Tiger | Bagh | I | EN | SU | P | Forest | 84 |
| *Herpestes urva* | Crab-eating Mongoose | Gangate Nyurimus | | LC | SU | | River beds | 8 |
| *Herpestes edwardsii* | Indian Grey Mongoose | Thulo Nyurimusa | | LC | | | Forest frienge | 18 |
| *Martes flavigula* | Yellow-throated Marten | Malsapro | | LC | | | Forest | 25 |
| *Mellivora capensis* | Honey badger | | | LC | | | | 7 |
| *Viverra zibetha* | Large Indian Civet | Thulo Nirbailo | | NT | | | Forest | 127 |
| *Paguma larvata* | Masked Palm Civet | Gajale Nirbiralo | | LC | | | Forest | 3 |
| *Viverricula indica* | Small Indian Civet | Sano Nirbiralo | | LC | | | Forest | 47 |
| *Paradoxurus hermaphroditus* | Toddy Cat | Tadi Nirbiralo | | LC | | | Forest | 47 |
| *Boselaphus tragocamelus* | Blue bull | Nil Gai | | LC | VU | | Forest | 6 |
| *Bos gaurus* | Gaur Bison | Gauri Gai | I | VU | EN | P | Forest | 16 |
| *Muntiacus muntjak* | Barking Deer | Rate, Rato Mriga | | VU | SU | | Forest | 1058 |
| *Axis porcinus porcinus* | Hog Deer | Laguna, Pade | | EN | SU | | Forest | 36 |
| *Cervus unicolor* | Sambar Deer | Jarayo | | VU | SU | | Forest | 561 |
| *Axis axis* | Spotted Deer | Chittal | | LC | | | Forest | 889 |
| *Sus scrofa* | Wild Pig | Bandel | | LC | | | Forest | 215 |
| *Lepus nigricollis* | Indian Hare | Khairo Kharayo | | LC | | | Grassland | 74 |
| *Rhinoceros unicornis* | Greater One-horned Rhinoceros | Gainda | I | VU | EN | P | Forest | 132 |
| *Macaca mulatta* | Rhesus Macaque | Rato Bandar | | LC | SU | | Forest | 450 |
| *Semnopithecus hector* | Terai Gray Langur | Kalo Bangur | I | NT | | | Forest | 114 |
| *Elephas maximus* | Asiatic Elephant | Hatti | I | EN | EN | P | Forest, grassland | 249 |
| *Hystrix indica* | Indian Crested Porcupine | Jure Dumsi | | LC | | | Forest | 130 |

NTNC included **5236** species detections, including 11 species with endangered (EN), vulnerable (VU) or near threatened (NT) status according to IUCN classification.

# How we got here