

TRAINING ON

Planning and Design of Smart Infrastructure for Biodiversity Protection



25–27 April 2022

Rhino Lodge, Sauraha, Nepal



ADB

Clara Grilo



Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example



Objectives

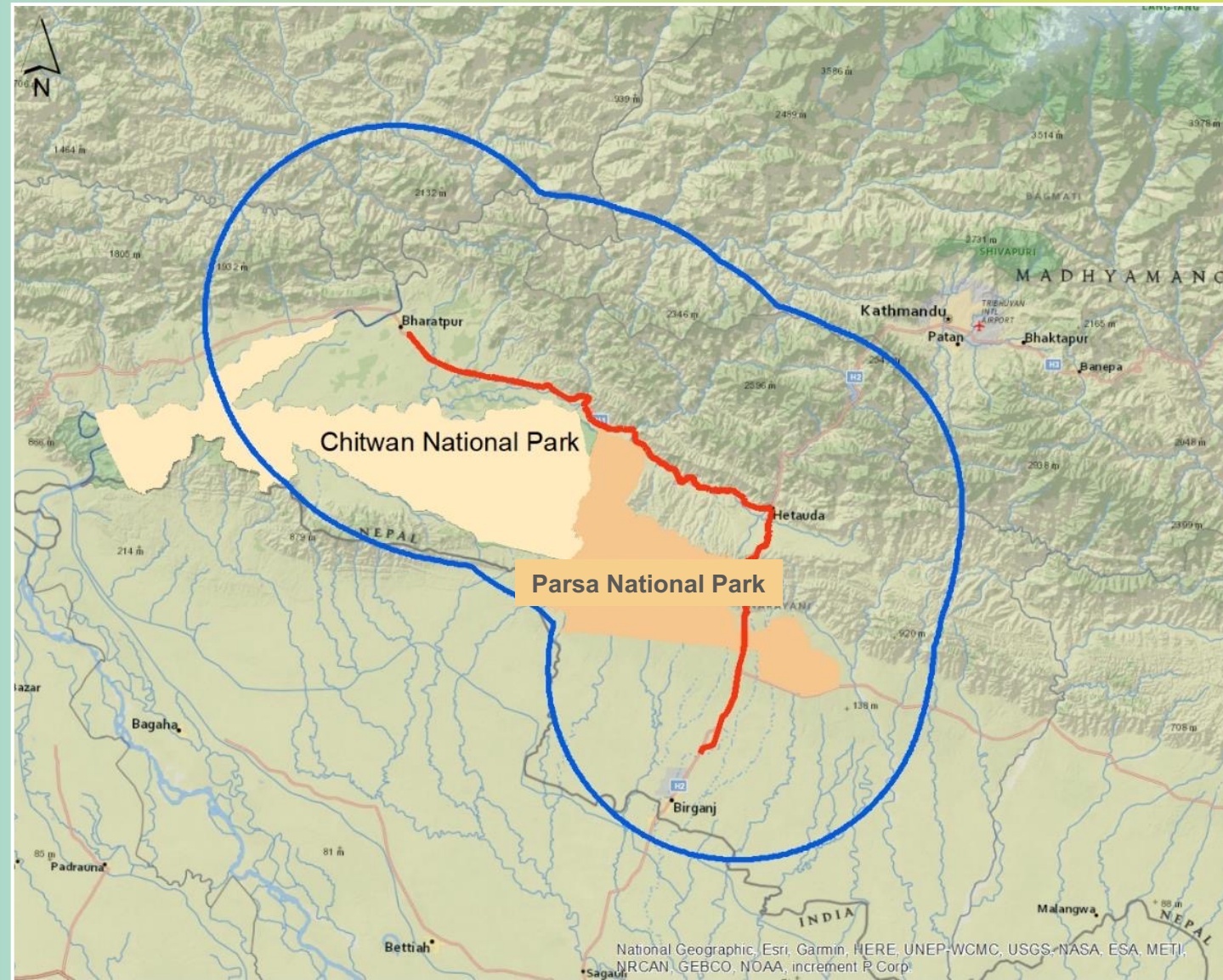
- Incidence of roadkill and individual crossings
- Existing passages are effective to keep habitat connectivity
- Potential corridors of movements

Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example

Study area

NHP: Narayanghat – Hetauda – Pathlaiya
108 km



Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example

Data needed

LITERATURE COMPILATION

- ✓ Ecological corridors
- ✓ Landscape and key habitats
- ✓ Species data
- ✓ Environmental data

FIELDWORK

- ✓ Roadkill data
- ✓ Species occurrence
- ✓ Underpasses use

Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example

Data needed

FIELDWORK



Roadkill survey



Camera trapping



Sign survey



Bird watching



Underpasses
monitoring

Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example

Data needed

Road-kill survey

- **How?** Motorbikes
- **When?** 5 days per week during the early morning hours;
- **Who?** Field technicians carried cell phones with a project-created App designed in ArcGIS Survey 123.
- **What?** Wildlife observed as road-kill or live (crossing or adjacent to road) were recorded on a form within the App.



Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example

Data needed

Camera trapping



- **When?** Surveys were conducted during both wet (Jan-May) and dry (Jun-Oct) seasons.
- **Survey period?** 20-days/season over 2 years
- **Where?** Species occurrence surveys were focused in specific areas along NHP where wildlife had the highest likelihood of being detected
- **Where?** placed in the field close to the road (~200m) and in alternate grid cell (2x2km) we placed a camera trap at a greater distance (~700m).

Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example

Data needed

Sign survey



- **How?** transect method
- **When?** visiting camera traps during set up and removal. Surveys consisted of walking a straight line transect from NHP road to the camera sampling site.
- **Type of signs?** tracks, scats/pellets, other sign of presence
- **Data compilation?** These data were recorded using the ArcGIS App Survey 123 while running the transect and then uploaded to our NREP data platform.

Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example

Data needed

Bird watching

- **Method?** point count method for bird surveys.
- **Where?** a sub-sample of the camera sites, representing of wide diversity of bird's habitats and terrain in the study area at dry (before June 15) and wet (June 16 to end of September) seasons.
- **When?** either in the morning or afternoon.
- **How?** Number of individuals of each species was recorded in the data sheets.



Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example

Data needed



Underpasses monitoring

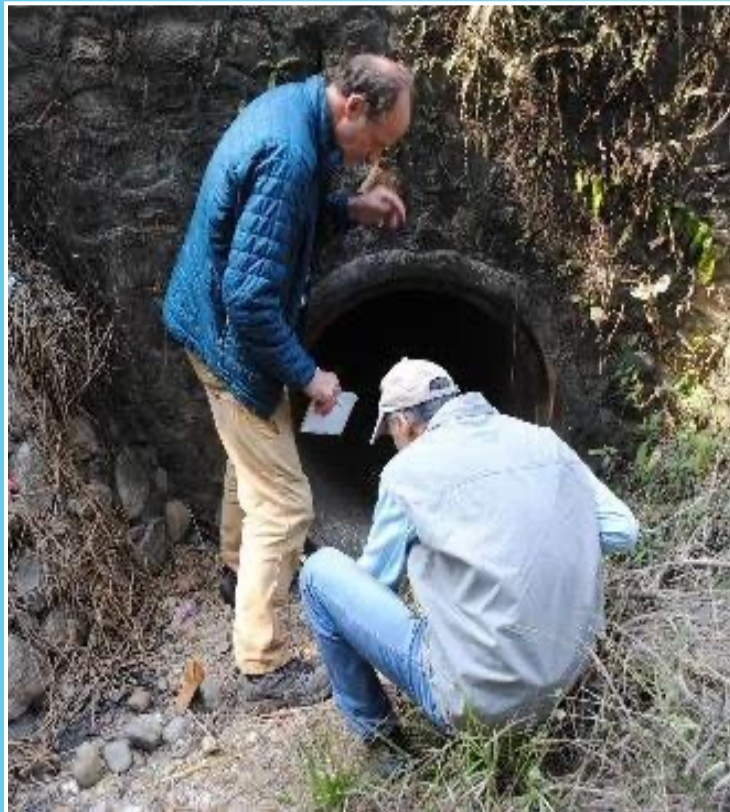
- **How much?** 13 underpasses
- **When?** 2/week
- **When?** from February 2020 to June 2020 (except April and May 2020).
- **Which ones?** Good representation of shapes and sizes
- **How to do it?** Using track through dust from the ground

Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example

Data needed

Underpasses monitoring



Sites	Name	Chainage	Type	Shape	Height	Width
HP1	Hotel Turahi	380+290	box culvert	rectangular	2.5	2
HP2	Dead dog	388+014	viaduct (2x)	rectangular	1.5	14
HP3	Gundo bridge	385+028	viaduct (7x)	rectangular	1	28
HP4	Clean culvert	383+435	culvert	circular	1	1
HP5	Monkey culvert	380+750	culvert	circular	1	1
HP6	Parsa culvert	371+800	box culvert	rectangular	1	4
HP7	Parsa culvert	370+450	box culvert	rectangular	1	4
NHP1	NHP1	418+837	culvert	circular	1.5	1.5
NHP2	NHP2	419+957	culvert	circular	1.5	1.5
NHP3	NHP3	429+042	box culvert	rectangular	2	2
NHP4	NHP4	436+144	culvert	circular	1	1
NHP5	Leopard track	466+810	culvert	circular	1.5	1.5
NHP6	Mini culvert	466+050	culvert	circular	0.8	0.8

Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example

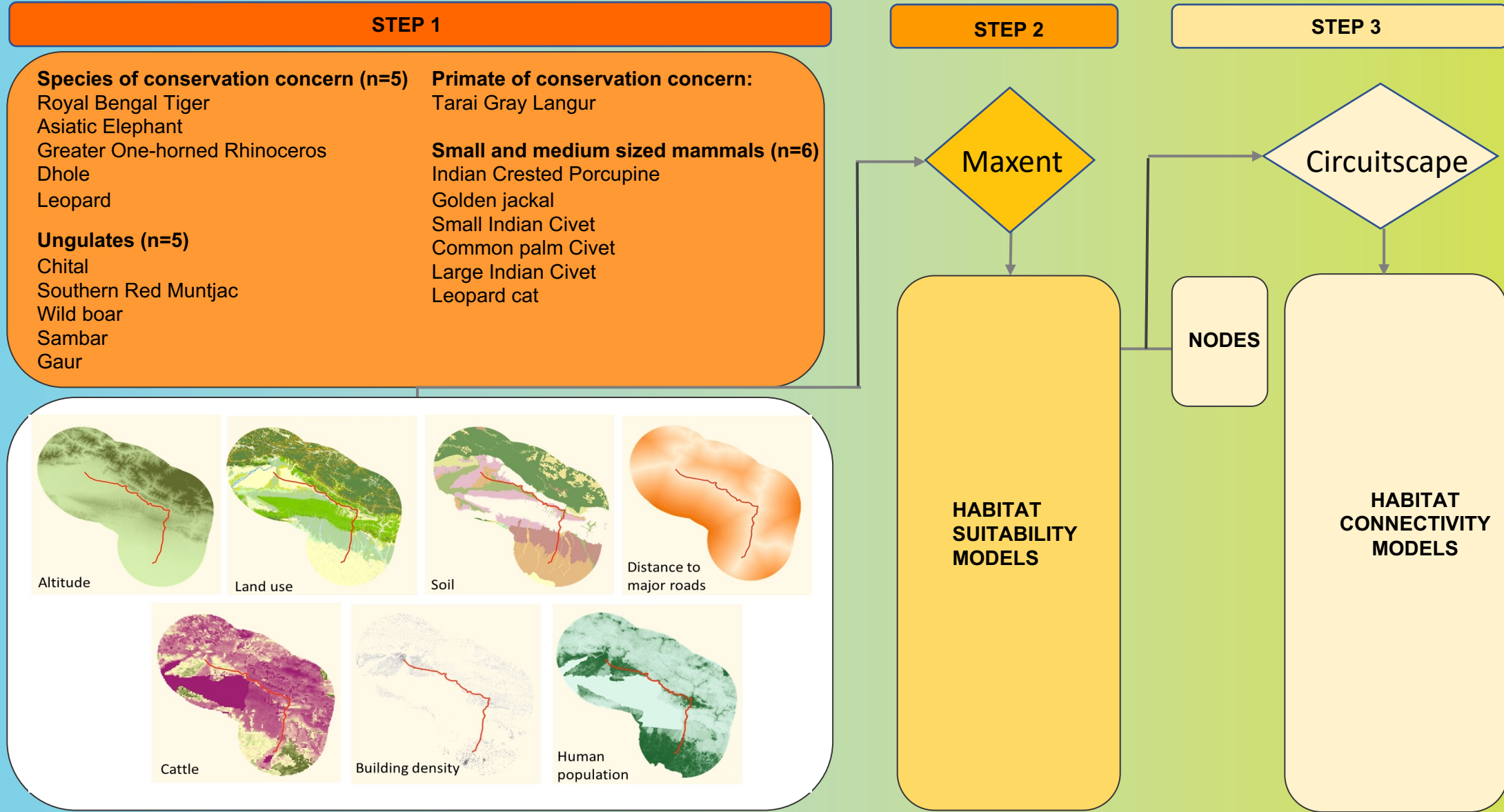
Data needed

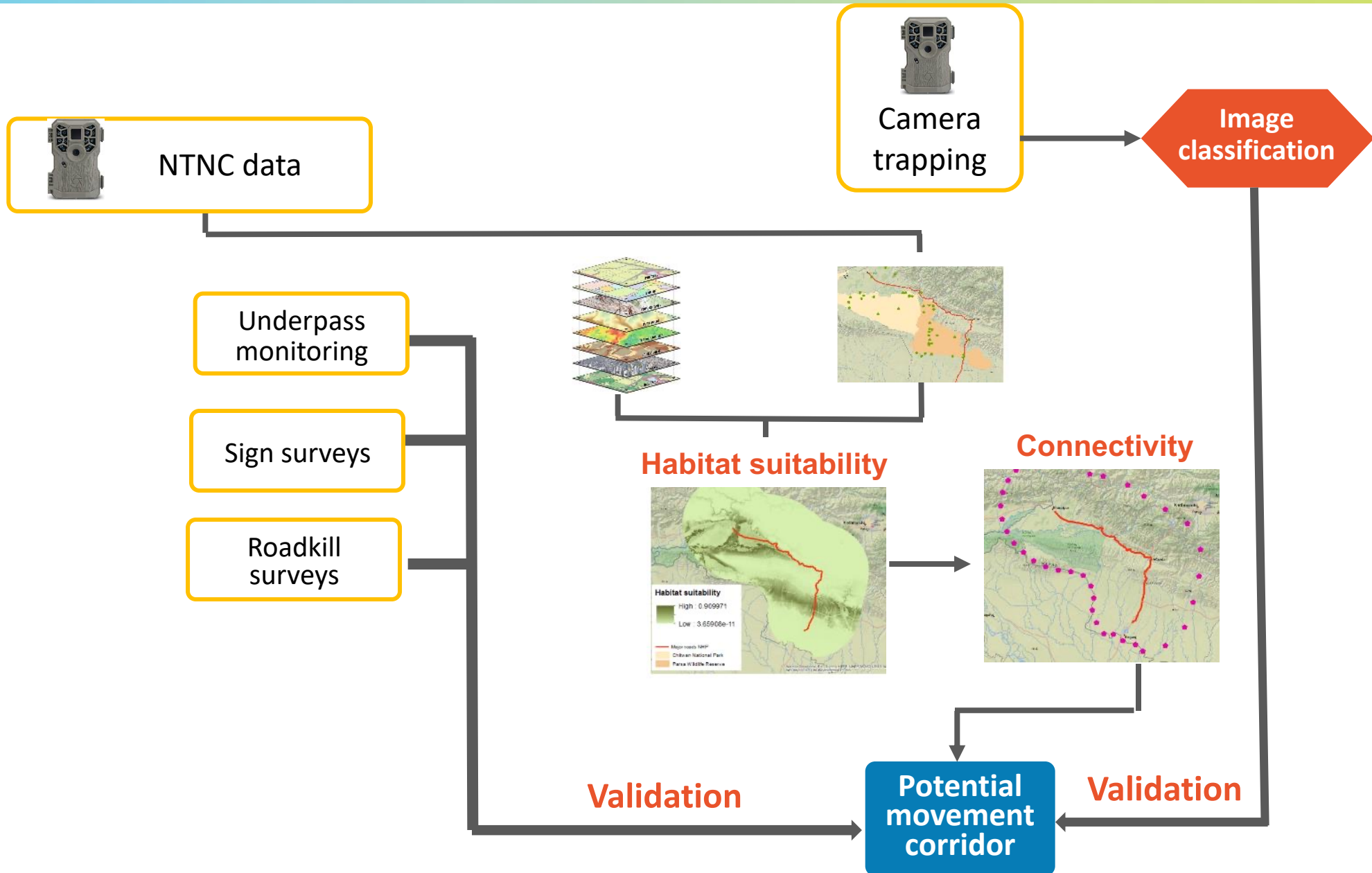
NTNC data (National Tiger survey)
Chitwan NP camera trapping



Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example





Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

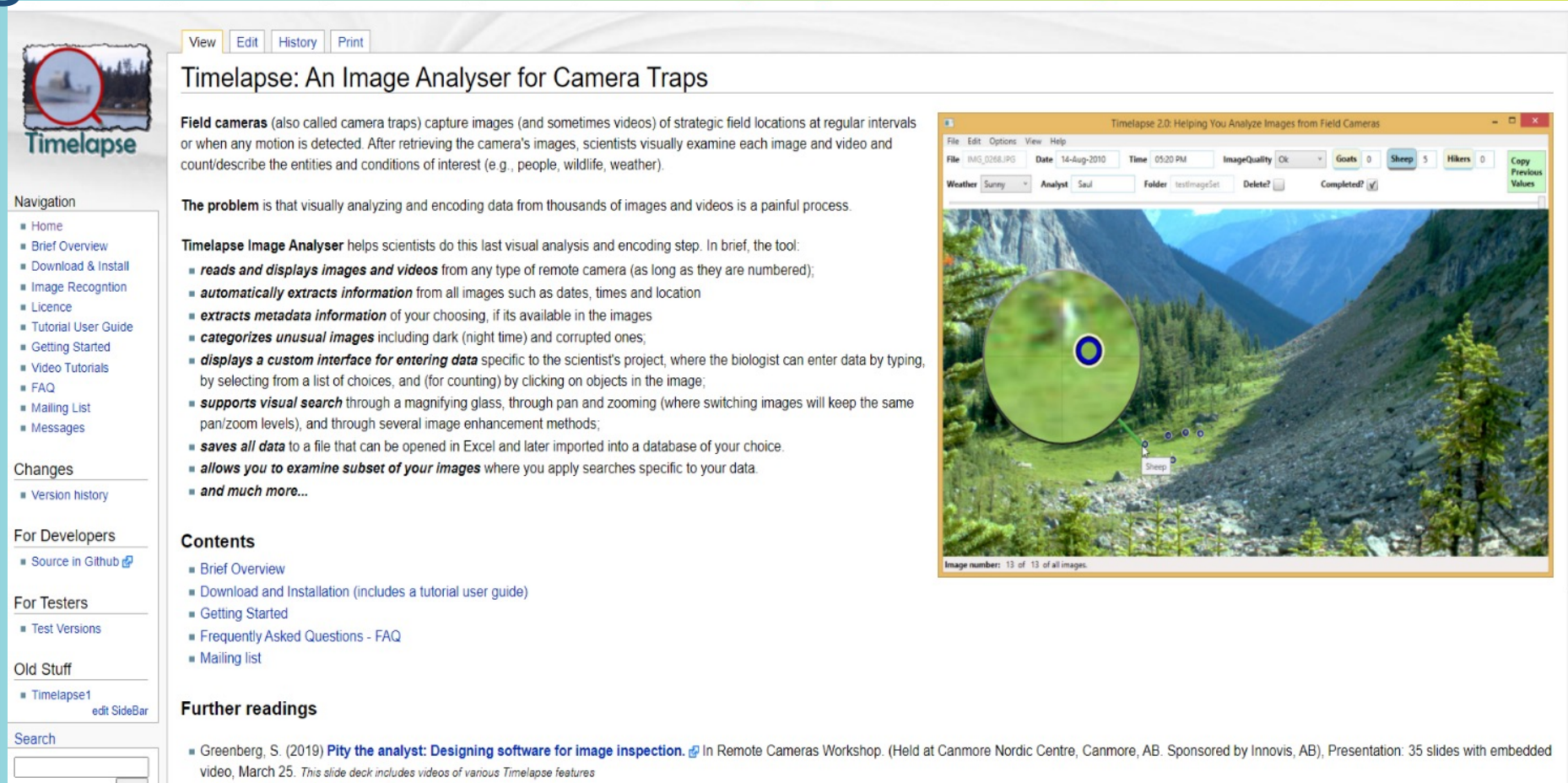
Narayanghat – Hetauda – Patlaiya (NHP) example

Data analysis

Camera trapping

Image classification

TIMELAPSE - <http://saul.cpsc.ucalgary.ca/timelapse/>



The screenshot displays the Timelapse website and its software interface. The website header includes navigation links: View, Edit, History, and Print. The main heading is "Timelapse: An Image Analyser for Camera Traps". Below this, a paragraph describes field cameras and their use. A section titled "The problem" states that visually analyzing and encoding data from thousands of images and videos is a painful process. The "Timelapse Image Analyser" section lists its features: reading and displaying images and videos, automatically extracting information, extracting metadata, categorizing unusual images, displaying a custom interface for entering data, supporting visual search, saving all data, and allowing examination of subsets of images. A "Contents" list includes Brief Overview, Download and Installation, Getting Started, Frequently Asked Questions - FAQ, and Mailing list. A "Further readings" section cites a presentation by Greenberg, S. (2019). The software interface on the right shows a window titled "Timelapse 2.0: Helping You Analyze Images from Field Cameras". It includes a menu bar (File, Edit, Options, View, Help), a toolbar with buttons for File, Date, Time, ImageQuality, Goats, Sheep, Hikers, Weather, Analyst, Folder, Delete?, and Completed?, and a large image viewer displaying a landscape with a magnifying glass over a specific area. The status bar at the bottom indicates "Image number: 13 of 13 of all images."

Timelapse: An Image Analyser for Camera Traps

Field cameras (also called camera traps) capture images (and sometimes videos) of strategic field locations at regular intervals or when any motion is detected. After retrieving the camera's images, scientists visually examine each image and video and count/describe the entities and conditions of interest (e.g., people, wildlife, weather).

The problem is that visually analyzing and encoding data from thousands of images and videos is a painful process.

Timelapse Image Analyser helps scientists do this last visual analysis and encoding step. In brief, the tool:

- reads and displays images and videos from any type of remote camera (as long as they are numbered);
- automatically extracts information from all images such as dates, times and location
- extracts metadata information of your choosing, if its available in the images
- categorizes unusual images including dark (night time) and corrupted ones;
- displays a custom interface for entering data specific to the scientist's project, where the biologist can enter data by typing, by selecting from a list of choices, and (for counting) by clicking on objects in the image;
- supports visual search through a magnifying glass, through pan and zooming (where switching images will keep the same pan/zoom levels), and through several image enhancement methods;
- saves all data to a file that can be opened in Excel and later imported into a database of your choice.
- allows you to examine subset of your images where you apply searches specific to your data.
- and much more...

Contents

- Brief Overview
- Download and Installation (includes a tutorial user guide)
- Getting Started
- Frequently Asked Questions - FAQ
- Mailing list

Further readings

- Greenberg, S. (2019) **Pity the analyst: Designing software for image inspection.** In Remote Cameras Workshop. (Held at Canmore Nordic Centre, Canmore, AB. Sponsored by Innovis, AB), Presentation: 35 slides with embedded video, March 25. This slide deck includes videos of various Timelapse features

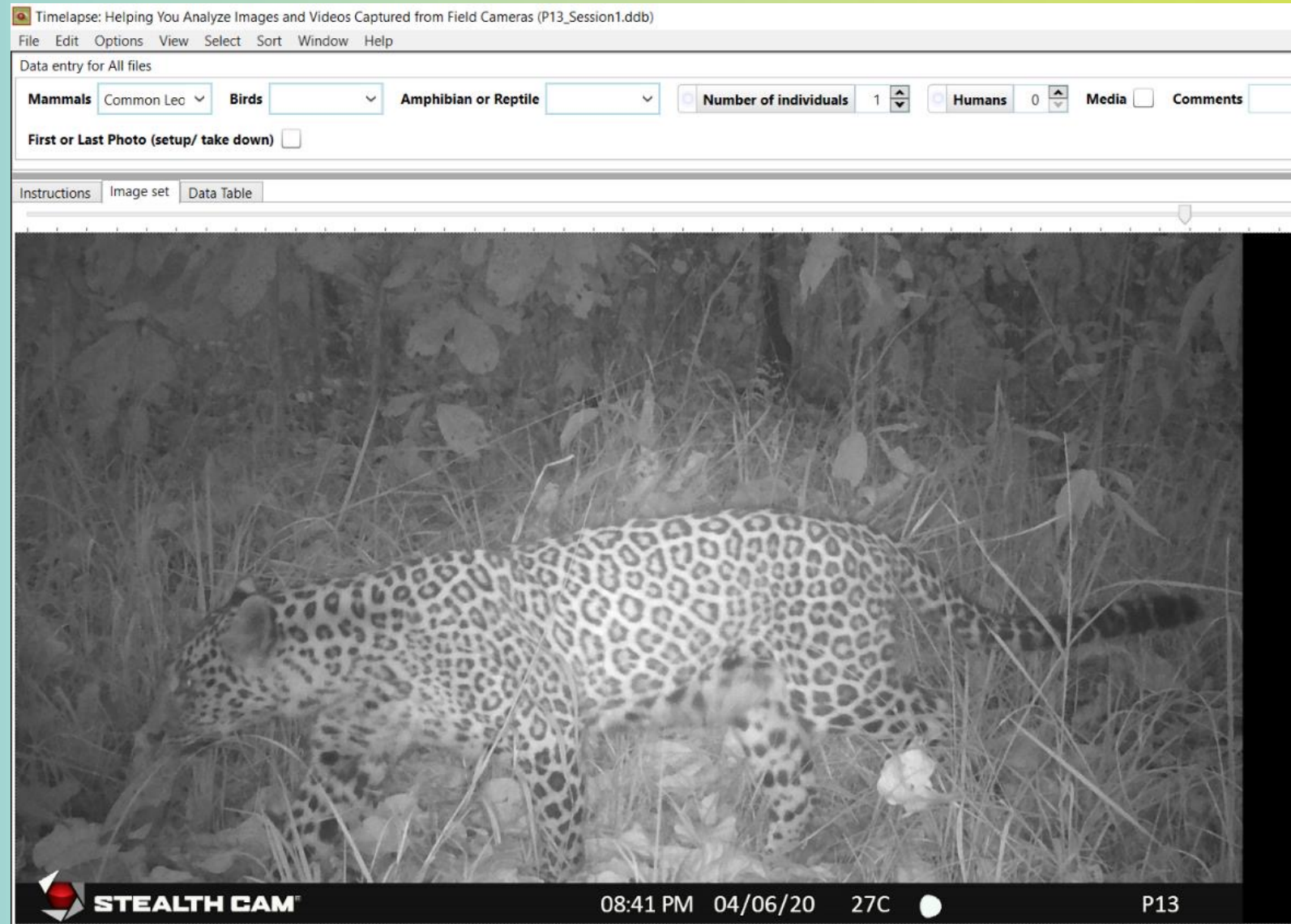
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Data analysis

Camera trapping

Image classification



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Data analysis

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Image classification

Timelapse: Helping You Analyze Images and Videos Captured from Field Cameras (P13_Session1.ddb)

File Edit Options View Select Sort Window Help

Data entry for All files

Mammals Common Leo Birds Amphibian or Reptile Number of individuals 1 Humans 0 Media Comments

First or Last Photo (setup/ take down)

Instructions Image set Data Table

Displays the contents of the database, including changes as they occur.
The highlight row indicates the currently viewed file

Id	Mammals	Birds	AmphibRept	Count	Sex	Humans	Analyst	PublicityShot	Comments	File	RelativePath	Folder	DateTime	UtcOffset	Date	Time	ImageQuality	DeleteFlag	FirstLastPhoto
387	Wild Pig			1		0		false		STC_0387.JPG		P13	4/2/2020 6:23:19 PM	1	02-Apr-2020	19:23:19	Ok	false	false
388				1		0		false		STC_0388.JPG		P13	4/2/2020 6:23:20 PM	1	02-Apr-2020	19:23:20	Ok	false	false
389				1		0		false		STC_0389.JPG		P13	4/2/2020 6:23:21 PM	1	02-Apr-2020	19:23:21	Ok	false	false
390				1		0		false		STC_0390.JPG		P13	4/2/2020 6:23:22 PM	1	02-Apr-2020	19:23:22	Ok	false	false
391				1		0		false		STC_0391.JPG		P13	4/3/2020 8:16:48 PM	1	03-Apr-2020	21:16:48	Ok	false	false
392				1		0		false		STC_0392.JPG		P13	4/3/2020 8:16:49 PM	1	03-Apr-2020	21:16:49	Ok	false	false
393	Gaur			1		0		false	doubt in iD Gaur?	STC_0393.JPG		P13	4/3/2020 8:16:50 PM	1	03-Apr-2020	21:16:50	Ok	false	false
394				1		0		false		STC_0394.JPG		P13	4/3/2020 8:16:51 PM	1	03-Apr-2020	21:16:51	Ok	false	false
395				1		0		false		STC_0395.JPG		P13	4/3/2020 8:16:52 PM	1	03-Apr-2020	21:16:52	Ok	false	false
396				1		0		false		STC_0396.JPG		P13	4/3/2020 8:16:53 PM	1	03-Apr-2020	21:16:53	Ok	false	false
397				1		0		false		STC_0397.JPG		P13	4/4/2020 9:10:19 PM	1	04-Apr-2020	22:10:19	Ok	false	false
398				1		0		false		STC_0398.JPG		P13	4/4/2020 9:10:20 PM	1	04-Apr-2020	22:10:20	Ok	false	false
399	other			1		0		false	doubt in iD	STC_0399.JPG		P13	4/4/2020 9:10:21 PM	1	04-Apr-2020	22:10:21	Ok	false	false
400				1		0		false		STC_0400.JPG		P13	4/4/2020 9:10:22 PM	1	04-Apr-2020	22:10:22	Ok	false	false
401				1		0		false		STC_0401.JPG		P13	4/4/2020 9:10:23 PM	1	04-Apr-2020	22:10:23	Ok	false	false
402				1		0		false		STC_0402.JPG		P13	4/4/2020 9:10:24 PM	1	04-Apr-2020	22:10:24	Ok	false	false
403				1		0		false		STC_0403.JPG		P13	4/5/2020 2:03:23 PM	1	05-Apr-2020	15:03:23	Ok	false	false
404				1		0		false		STC_0404.JPG		P13	4/5/2020 2:03:24 PM	1	05-Apr-2020	15:03:24	Ok	false	false
405				1		0		false		STC_0405.JPG		P13	4/5/2020 2:03:25 PM	1	05-Apr-2020	15:03:25	Ok	false	false
406				1		0		false		STC_0406.JPG		P13	4/5/2020 2:03:26 PM	1	05-Apr-2020	15:03:26	Ok	false	false
407				1		0		false		STC_0407.JPG		P13	4/5/2020 2:03:27 PM	1	05-Apr-2020	15:03:27	Ok	false	false
408				0	1			false	walking	STC_0408.JPG		P13	4/5/2020 2:03:28 PM	1	05-Apr-2020	15:03:28	Ok	false	false
409				1		0		false		STC_0409.JPG		P13	4/6/2020 7:41:09 PM	1	06-Apr-2020	20:41:09	Ok	false	false
410	Common Leopard			1		0		false		STC_0410.JPG		P13	4/6/2020 7:41:10 PM	1	06-Apr-2020	20:41:10	Ok	false	false
411				1		0		false		STC_0411.JPG		P13	4/6/2020 7:41:12 PM	1	06-Apr-2020	20:41:12	Ok	false	false
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413				1		0		false		STC_0413.JPG		P13	4/6/2020 7:41:14 PM	1	06-Apr-2020	20:41:14	Ok	false	false
414				1		0		false		STC_0414.JPG		P13	4/6/2020 7:41:15 PM	1	06-Apr-2020	20:41:15	Ok	false	false
415				1		0		false		STC_0415.JPG		P13	4/6/2020 8:24:32 PM	1	06-Apr-2020	21:24:32	Ok	false	false

File: 412 of 529 Select: All files Sorted by: Id1 (the order files were added to Timelapse)

Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example



Outputs

Roadkill records

Family	Common name	Roadkill	Road crossing	Live observed	
				Detections	# of individuals
Reptiles	Water snake	1			
	Copper headed trinket	1			
	Burmese python	2			
	Banded krait	1			
	Others	5			
Birds	Spotted dove	1			
	Common myna	1			
	Red-vented Bulbul			1	1
	Others	7		1	1
Mammals	Dhole	1			
	Golden jackal	3			
	Royal Bengal tiger	1			
	Leopard	1	1		
	Jungle cat	8			
	Sloth bear	1			
	Common palm civet	5			
	Southern Red Muntjac			2	6
	Chital	1	1	23	156
	Wild boar		2	2	2
	Greater One-horned Rhinoceros			2	3
	Rhesus monkey	3	8	33	416
	Tarai Gray Langur			2	8
	Indian crested porcupine	1			
	Others	8	1		
TOTAL		52	13	66	593

Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example

Outputs

Roadkill records

Large mammals



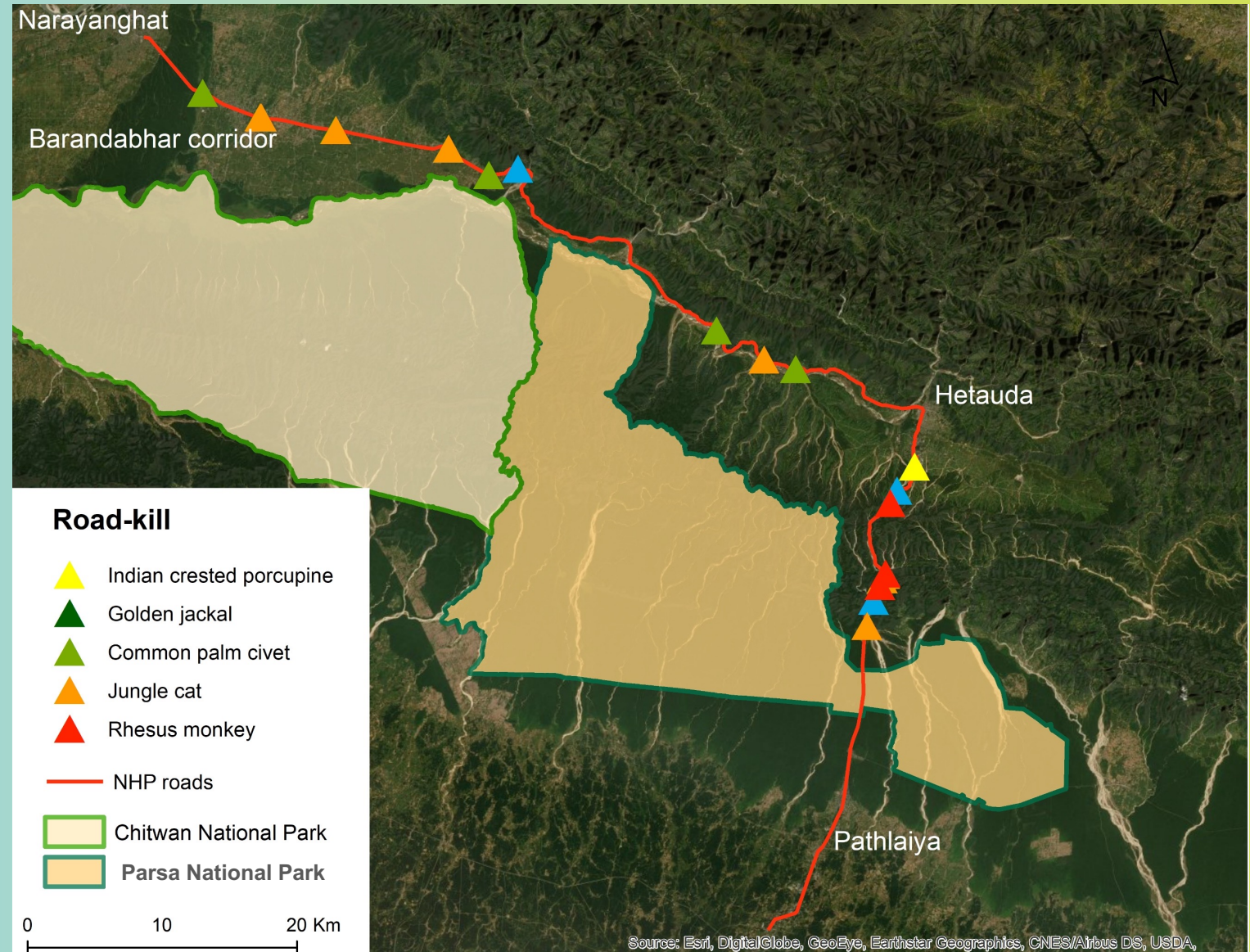
Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example

Outputs

Roadkill records

Small/medium
sized mammals



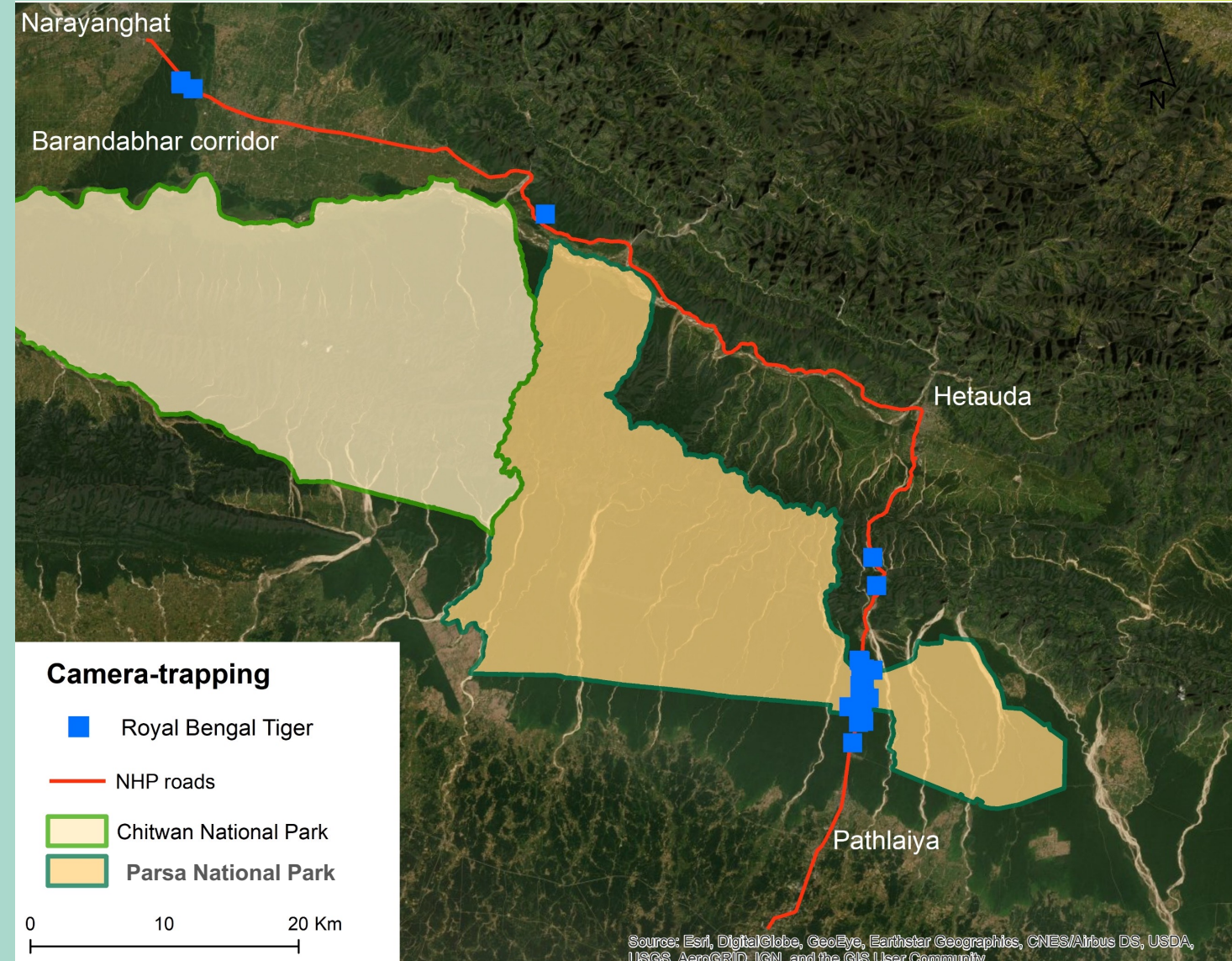
Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example

Outputs

Camera trapping

Royal Bengal Tiger



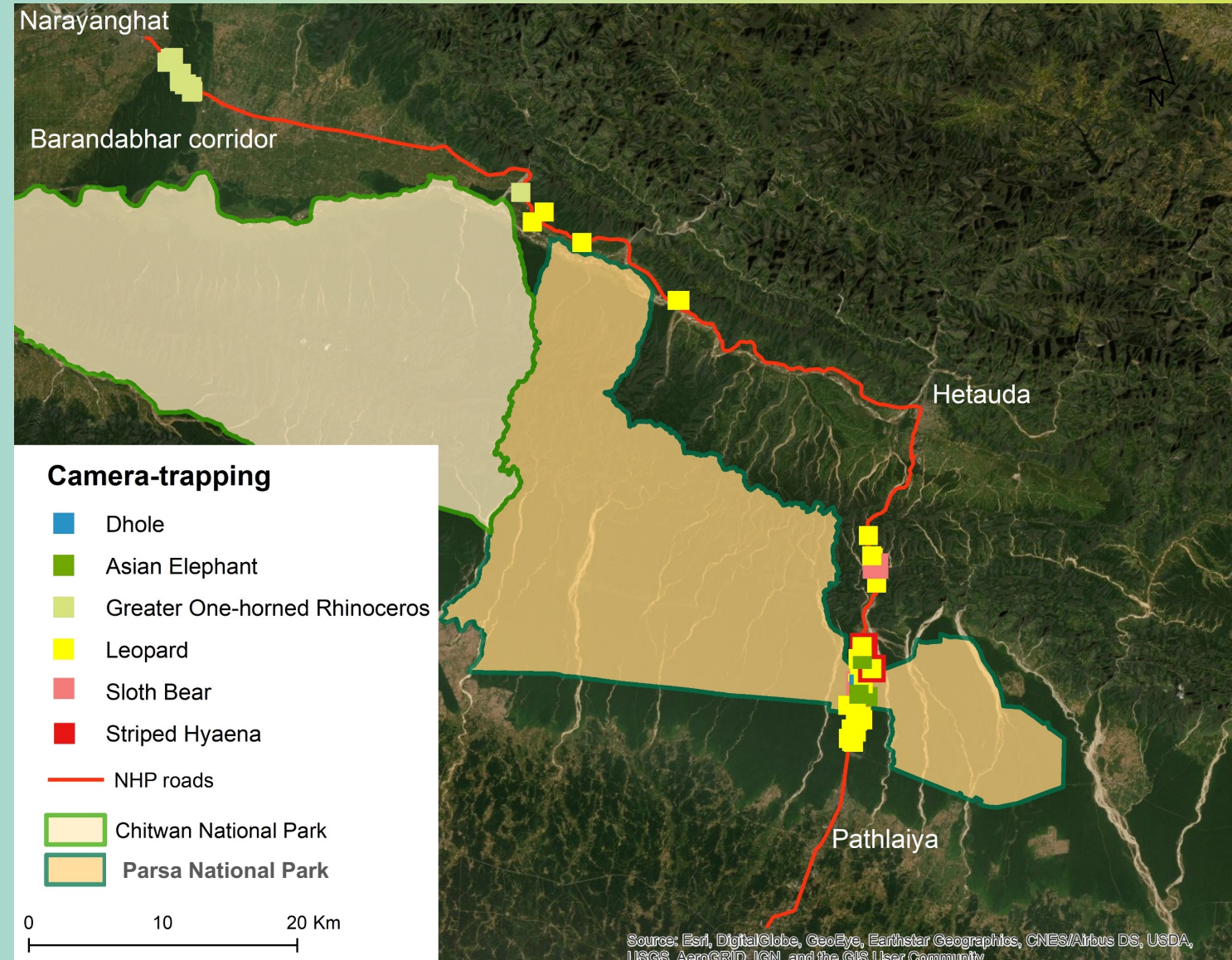
Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example

Outputs

Camera trapping

Large mammals



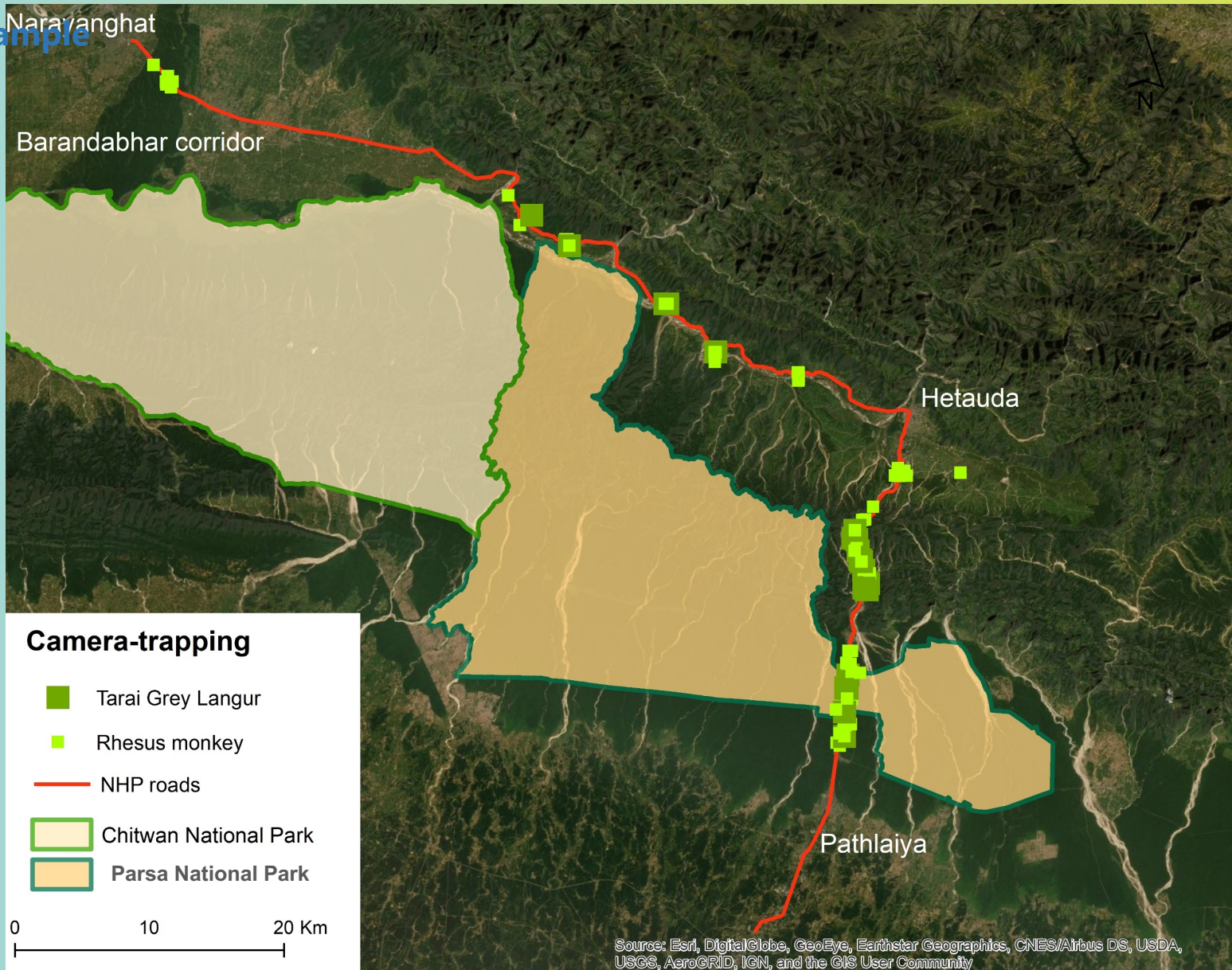
Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example

Outputs

Camera trapping

Primates



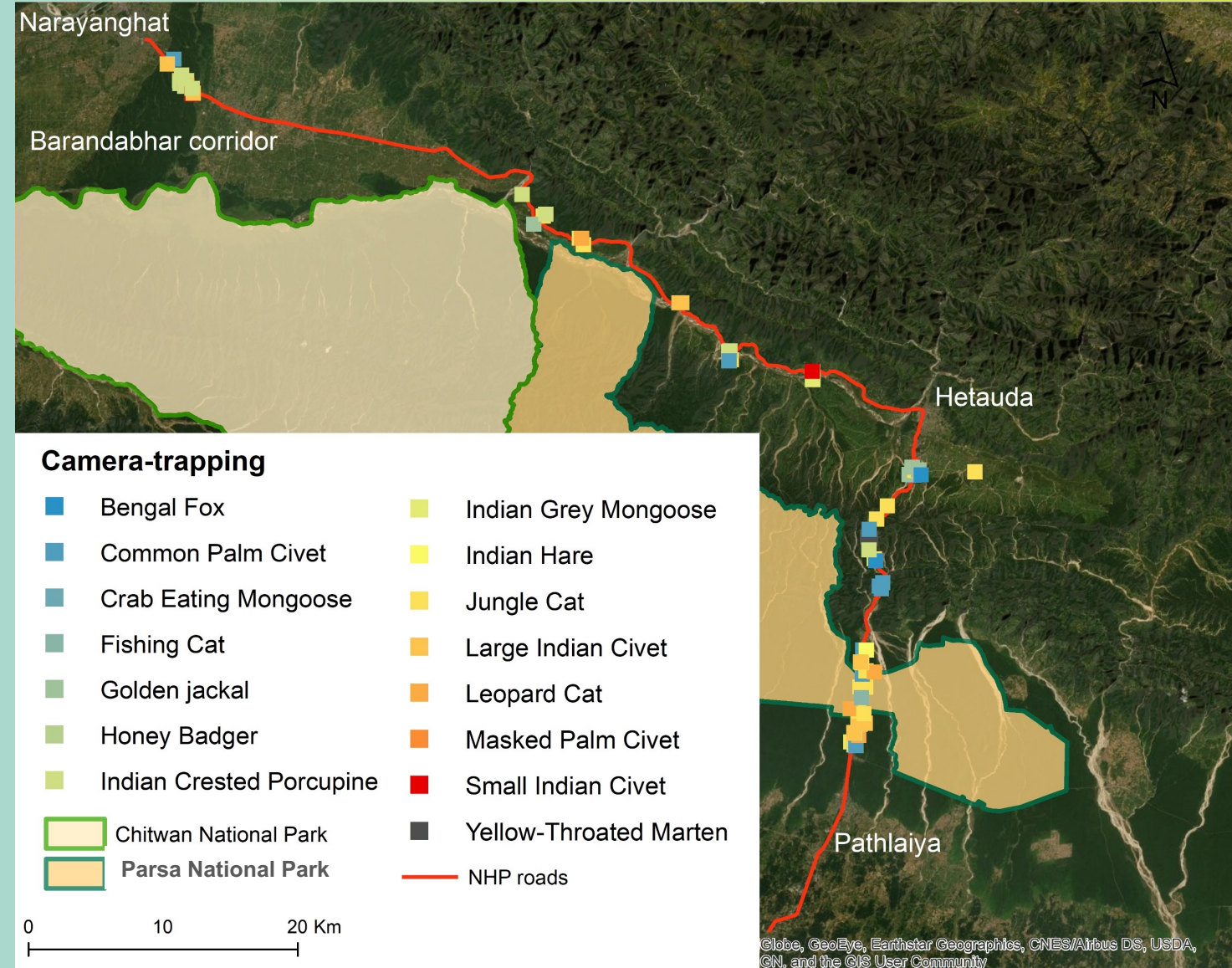
Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example

Outputs

Camera trapping

Small/medium
sized mammals



Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example



Outputs

SIGN SURVEYS

Species	Sign detection	Live observation
One-horned rhinoceros	11	--
Barking deer	5	--
Common palm civet	2	--
Golden jackal	2	--
Jungle cat	1	--
Sambar	13	1
Sloth bear	1	--
Spotted deer	26	1
Wild boar	3	12
Total	64	14

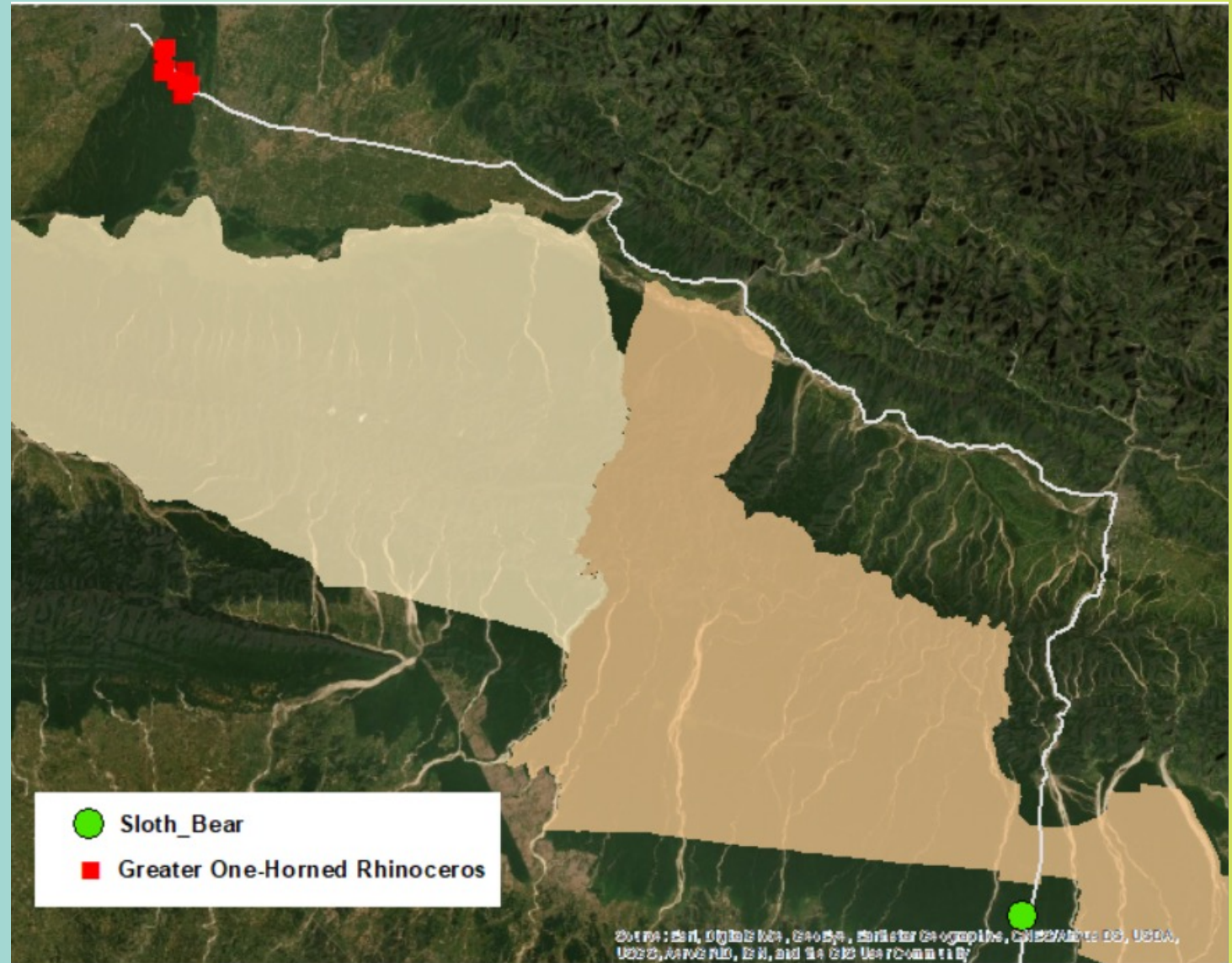
Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example



Outputs

SIGN SURVEYS



Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example



Outputs

BIRD SURVEYS

- ✓ 72 species of birds belonging to 37 families were recorded (n= 725 individuals)
- ✓ one species is Vulnerable (Lesser Adjutant) and 2 species are Near Threatened (Red-breasted parakeet and Alexandrine parakeet)



Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example

Outputs

Underpasses monitoring



SN	Species	Shape and size of underpasses (m)	
		Circular (diameter)	Rectangular/square (height x length)
1	Common Leopard	1.5	--
2	Common Mongoose	1.0; 1.5	2.0x2.0
3	Common Palm Civet	1.5; 0.8; 1.0	2.0x2.0
4	Golden Jackal	1.5; 0.8; 1.0	2.0x2.0
5	Jungle Cat	1.5; 0.8; 1.0	2.0x2.1
6	Large Indian Civet	1.5	--
7	Field Mouse	1.5; 1.0	--
8	Rhesus Monkey	1.0	--
9	Small Indian Civet	1.5	--
10	Chital/Spotted Deer	--	1.4x4.0
11	Royal Bengal Tiger	--	2.5x2.0

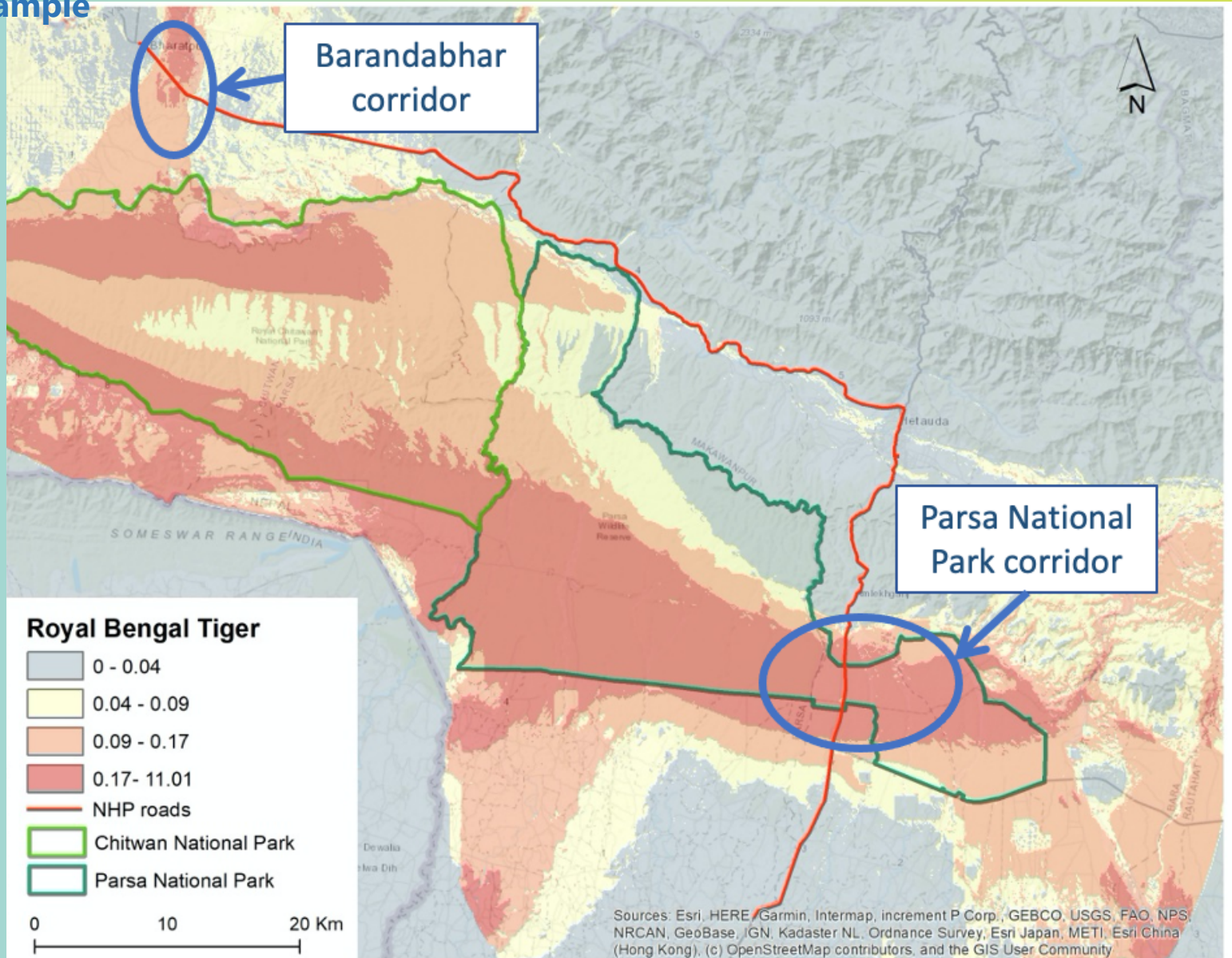
Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example

Outputs

Potential
movement corridors

Royal Bengal Tiger



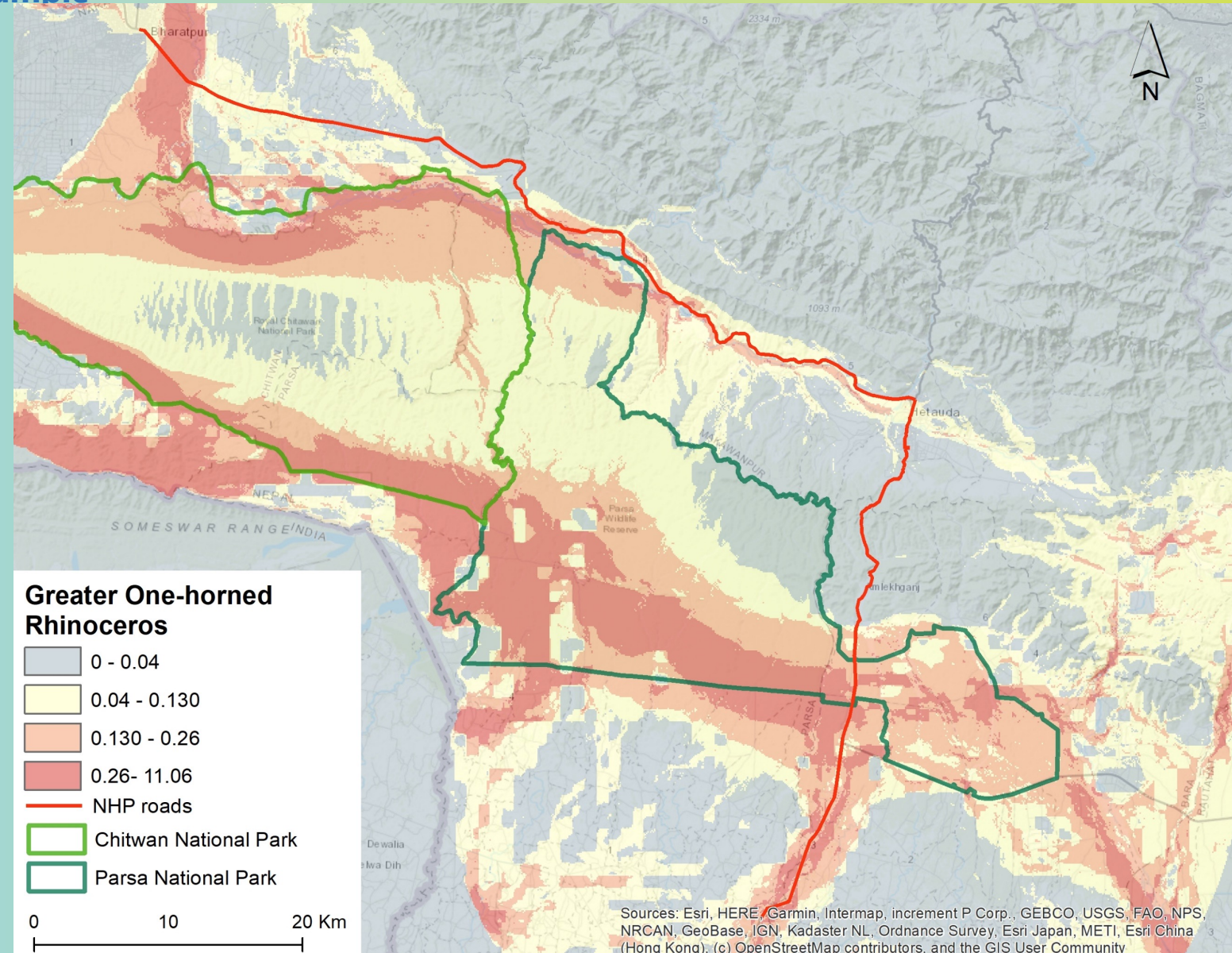
Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example

Outputs

Potential
movement corridors

Greater One-horned
Rhinoceros

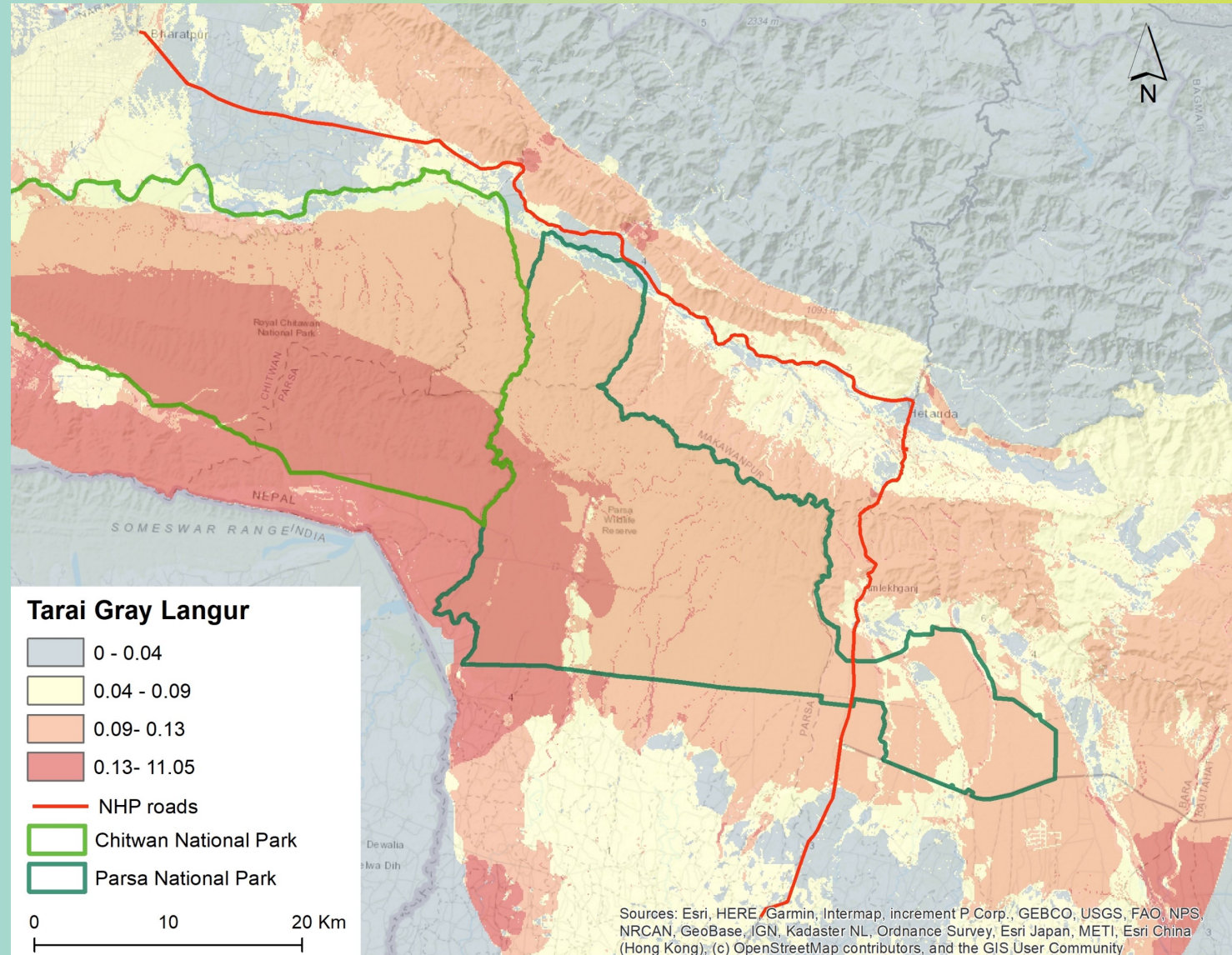


Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example

Outputs

Potential
movement corridors
Tarai Gray
Langur



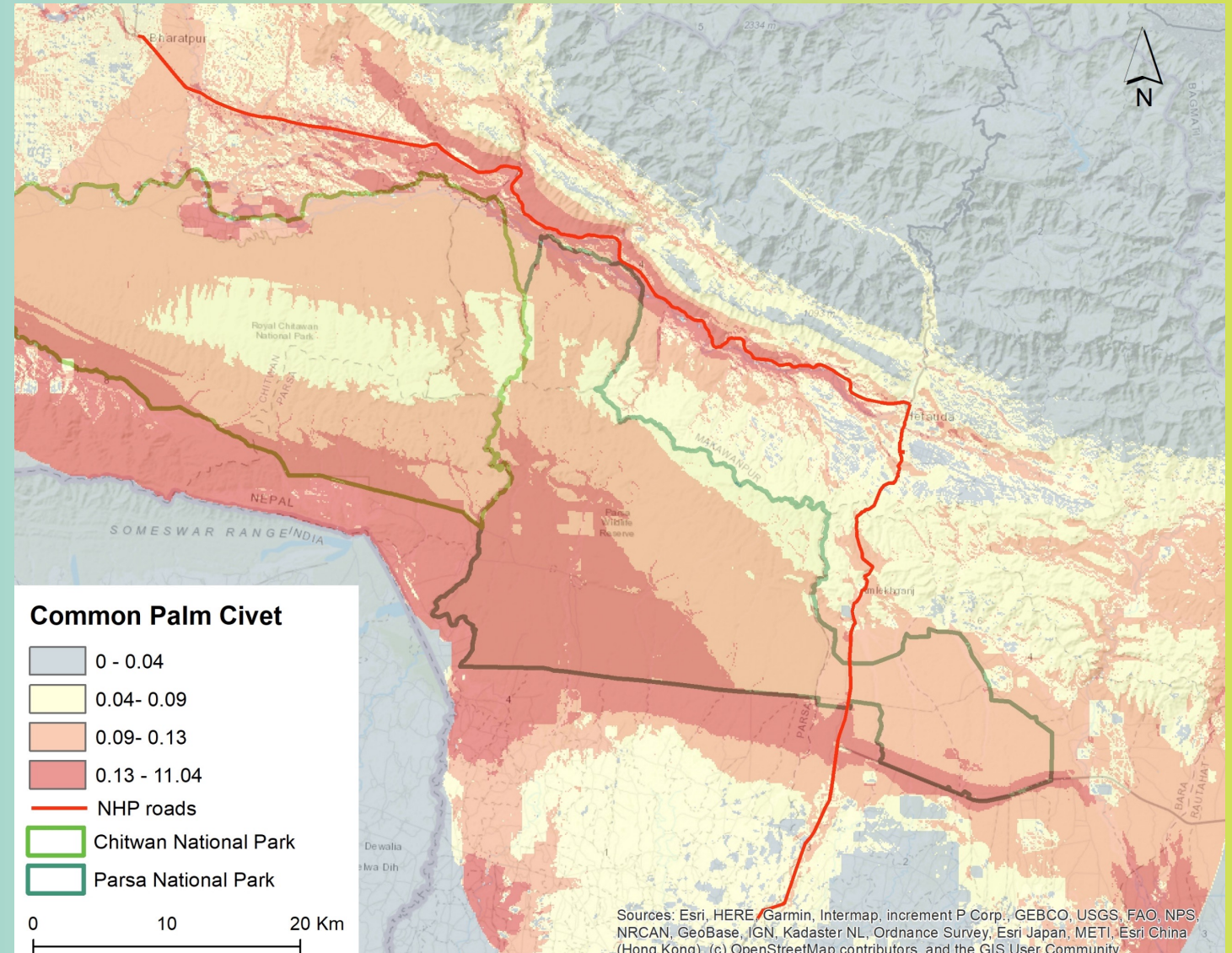
Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example

Outputs

Potential
movement corridors

Common palm civet



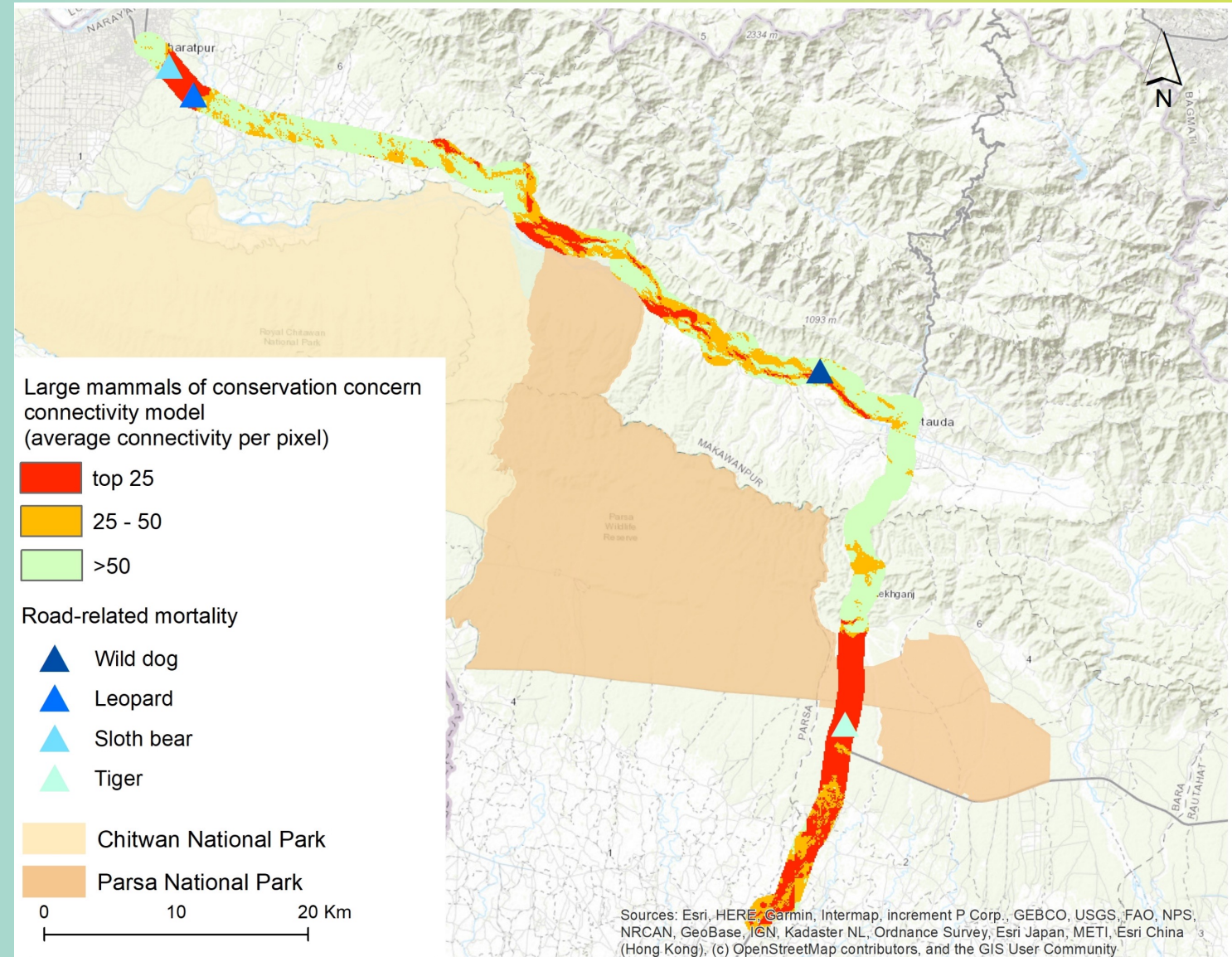
Baseline Biodiversity Assessment (BBA) and Safeguard Planning: Data need, analyses and outputs

Narayanghat – Hetauda – Patlaiya (NHP) example

Outputs

Potential
movement corridors

Large mammals of
conservation concern



THANK YOU



तपाईंको ध्यानाकर्षनको लागि धन्यवाद



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