

Student's handout

Returns of the Unicorn: Socio-Environmental Synthesis of One Horned Rhinoceros (*Rhinoceros unicornis*) Conservation in Nepal



Mother and calf of one-horned rhinoceros in their typical habitat Chitwan National Park, Nepal

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Note to instructors: Please contact me if you use this case study for sharing your experiences. You can reach Anil Shrestha at anil.shrestha@ubc.ca

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Case study introduction and learning objectives:

In this case study, you will learn about a complex socio-environmental system related to how once threatened species the One-horned rhinoceros has been brought back from brink of extinction in Nepal. You will (1) be first introduced to the status of one horned rhinoceros population in Nepal, drivers of its population decline and key policy and practical interventions to address those challenges (2) will identify and describe socio-environmental components and explain their complex interaction and feedbacks (3) will apply SES framework to analyze conservation success of rhino conservation in Nepal through collaborative learnings.

Module1-Introduction of Socio-Environmental Aspect of One horned rhinoceros conservation in Nepal

Pre-class readings

Thapa, K., Nepal, S., Thapa, G., Bhatta, S. R., & Wikramanayake, E. (2013). Past, present and future conservation of the greater one-horned rhinoceros *Rhinoceros unicornis* in Nepal. *Oryx*, 47(3), 345-351.

Lamichhane, B. R., Persoon, G. A., Leirs, H., Poudel, S., Subedi, N., Pokheral, C. P., & De longh, H. H. (2019). Contribution of buffer zone programs to reduce human-wildlife impacts: the case of the Chitwan National Park, Nepal. *Human Ecology*, 47(1), 95-110.

Background and context

Rhinoceros has been roaming in this planet since million of years conquering ice age, prehistoric hyenas and giant crocodile. Known as mega-herbivores (greater than 1000 kg), they are ecosystem engineer that plays vital role in regulating and maintaining ecosystems, facilitating other sympatric herbivores providing grazing lawns. However, this species has been losing battle with human and their activities. There are currently five extant species of rhinoceros: two species from Africa (hook-lipped rhinoceros often known as black rhinoceros, *Diceros bicornis*; Squared-lipped often known as white rhinoceros, *Ceratotherium simum*) and three species from Asia (Greater One Horned rhinoceros, *Rhinoceros unicornis*; Javan rhino, *Rhinoceros sondaicus*; Sumatran rhino, *Decerorhinus sumatrensis*). Among them, three species (black rhino, Javan rhino and Sumatran rhino) are enlisted as critically endangered species. Those rhino species which has not enlisted as critically endangered, also struggling for their survival and listed as endangered or vulnerable species. This is mainly because a significant area of rhinoceros habitat has been degraded or lost due to agriculture and human settlement over a last century. They have been hunted for centuries as agricultural pests as well as for trophies and meat. Traditionally, their skin has been used for shields and good luck charms. Since last few decades, their population plummeted particularly as rhinoceros were poached for their horns for traditional medicine and handles for ceremonial daggers.

Conservation Crisis of One-horned rhinoceros in Nepal

One-horned rhinoceros (*Rhinoceros unicornis*) is one of the five extant species of rhino, roaming around lowland riverine grassland and adjacent woodland in northwestern Burma, across the Gangetic plain, to the Indus river valley in Nepal, India, Bangladesh, Pakistan, Bhutan and Myanmar. (Browse this webpage for historical and current distribution of One-horned rhinoceros <https://bit.ly/2J8iT11>). During the early 19th century, scientist estimated half a million of one horned rhinoceros. However, their population started to reduce significantly coinciding with the start of permanent agriculture and human settlement in their prime habitat of Gangetic plain during ~1400 AD. This habitat destruction continued and peaked by the late 19th century. Populations of this mega-herbivore plummeted as they were hunted for sport or killed as agricultural pests resulting the species very close to extinction. For instance, during 18th century, a French Traveller described a scene of mass killings of wildlife including rhinoceros in India, “thousands of soldiers herded wild animals into a vast staked enclosure, which has then set ablaze and the creature slaughtered by the king and his retinue” what he described this event as to provide safety of the citizens and the crops from the wildlife. Sport hunting of wildlife such as rhinoceros for trophy among the royals was also very popular during the 18th century and early 19th century that results mass hunting of the flagship species including rhinoceros. For instance, King George V of Britain hunted 18 rhinos, 39 tigers and 4 sloth bears in the Chitwan valley of Nepal during his safari trip that lasted for 10 days (from 18-28 December 1911).

This Situation of declining population of rhino further exacerbated due to poaching of rhino for their horn, which is used for traditional medicine and handles for ceremonial daggers (<https://bit.ly/2d2TMiM> read this to know more about why rhino poaching has been increasing). For instance, about 132 rhinos were poached in Nepal during the late 1950s. Until 1950, the pristine habitat of rhino virtually free from the humans except a few number of an ethnic group “Tharu”, who has immune to Malaria. However, this situation was changed when there was eradication of malaria in the lowland Terai during 1960s. This triggered mass migration of people from the hills to the lowland Terai and resulted ~70% loss of forests and grasslands, the prime habitat of rhinoceros. Because of this double impact of habitat loss and poaching, rhino population once distributed throughout lowland of Nepal, their population was restricted only in Chitwan valley. Their number plummeted to less than 100 during 1970s from ~800 individuals during 1950s. Situation was not so different in India as well, where only less than 100 individuals restricted in disjunct populations while its population completely extirpated from their former range from Bangladesh, Pakistan and Myanmar.

Conservation initiatives to recover declining population of One Horned Rhinoceros in Nepal

Start of fortress conservation

Realizing the dire situation of one-horned rhino, conservation initiatives were started during 1960s, in Nepal. However, serious conservation efforts was initiated only during 1970s, when first national park “Chitwan National Park” was established to

protect rhino and their habitat. To prevent from poaching, a regiment of Nepal Army was also deployed. National Park and Wildlife Conservation Act 1973 was enacted, which listed rhinoceros as protected species that made hunting of this species illegal and severe persecution when hunting occurred. However, this conservation model followed fortress conservation model, in which indigenous and local community evicted and relocated from their traditional land. Indigenous and local people restricted and excluded from using natural resources in which their livelihood depended upon. For instance, about 22,000 indigenous and local people were evicted while establishing the national park. As a result, there was park and people conflict that resulted slow successful conservation of the species and their habitat.

Translocation of One-horned rhinoceros

Population of rhinoceros in Chitwan National Park gradually rebounded (~300 individuals) due to fortress conservation initiatives in 1980s, yet there was backlash between park and people. Since this population of rhino only restricted in Chitwan, there was high risk of extinction of this population in case of nature disaster such as disease, flooding etc. Therefore, to establish second population of rhino, 13 rhinos were successfully translocated to Bardia National Park during 1986 for the first time. Subsequently, other 64 rhinos were translocated in Bardia as well as Shukla Phanta national park (then wildlife reserve). This translocation not only help establishment of 2nd and 3rd population of rhino in Nepal but also helps to reduce human rhino conflict (crop depredations, human injury and loss of human life) in Chitwan National Park. <https://www.youtube.com/watch?v=-U-V33tqrHc> (Video on recent translocation of rhino in Nepal)

Community based conservation and rebound of one horned rhinoceros' population in Nepal

Recognizing negative effect of fortress conservation approach and growing park people conflict and increasing people centered conservation globally during 1980s, national park in Nepal including Chitwan allowed restricted collection of natural resources (such as grass, fuelwood and NTFP) necessary for local people's livelihood for few days in a year during 1976. Thus, people centered approach was initiated. However, it was only during 1990s when National Park and Wildlife Conservation Act 1973 was amended for the Fourth time with emphasis of people centered conservation. Community-based conservation was in full swing after enactment of this legislation when buffer zone declaration around protected areas was introduced. Most importantly, the landmark decision to share 30-50% of the park revenue with local people for conservation and community development led to support of local people and myriads of conservation activities that boost conservation of endangered species such as rhino and their habitat. This led to increase in rhino population from less than 100 to 544 in Chitwan national park during 2000.

However, this success again turned around due to decades of Maoist civil war when rhino population plummeted from 544 to ~400 between 2000 and 2006 mainly because of poaching. About 26% of the rhino population (152 individuals of rhinos) were poached between 2000-2010, peaked during 2002-2003. During this time, the rhino in Bardia (the second largest population) almost locally extinct due to poaching.

Luckily, the civil war ended in the 2006, realizing this dire situation, concerted efforts of rhino conservation were started again in 2007. Most emphasis was given to community-based conservation along with active involvement of community based anti-poaching unit as well as involvement of army for protection of rhino drastically reduced poaching so much so that there was zero poaching year in 2011 and continue for several years from 2015 to 2018 (<https://bit.ly/2tXZfLM> more information about how rhino conservation get support of local people). The latest census estimated, there are about 645 individuals of rhino in Nepal (605 in Chitwan National Park, 29 in Bardia National Park, 8 in Sukla Phanta National Park and 3 in Parsa National Park). Next census is scheduled to be held in 2020. Thus, the concerted effort of policy that empower and embrace the local community along with stringent protection and monitoring helped to restore rhino population from brink of extinction in Nepal.

Future Challenges ahead

Though the rhino population bounced back to ~645, they have been facing new challenges such as invasion of prime rhino habitat due to *Mikania micrantha*, which extended to almost 20% of the rhino's prime habitat. Similarly, recurrent flash flooding has become other emerging challenges for conservation of rhinoceros, which predicted to increase due to climate change. Most importantly, the recent increased natural death of rhino is a big cause of concern and one of the biggest threats for their long-term survival. About 80 rhinos were killed due to fighting for space such as water hole (wallowing is very important for rhinos) between rhinos between 2015-2018, approximately 20 rhinos/year. A team of experts now have been working to find out the causes and potential solution to address this issue. <https://news.mongabay.com/2018/10/whats-killing-nepals-rhinos/> (more information about future challenges of rhino conservation in Nepal)

Class Activity

You require to read pre-class readings and listen instructor's presentation in the class. After the presentation, you will form a group (not more than 3 individuals) and discuss about drivers of rhino population decline, various stakeholders involved, pros and cons of conservation approach (fortress and community based) as well as various mechanisms (policy, socio-economic and ecological efforts) introduced and implemented for its conservation. After discussion, each group will come to gather and share outcome of your discussion with other groups, and then synthesize key drivers, key stakeholders, various mechanisms (policy and practices) and discuss what worked and what did not work and why.

Module 2-Socio-Environmental System thinking framework for the case

Pre-class reading

Carter, N., Viña, A., Hull, V., McConnell, W., Axinn, W., Ghimire, D., & Liu, J. (2014). Coupled human and natural systems approach to wildlife research and conservation. *Ecology and Society*, 19(3).

Optional reading

Pulver, S., Ulibarri, N., Sobocinski, K. L., Alexander, S. M., Johnson, M. L., McCord, P. F., & Dell'Angelo, J. (2018). Frontiers in socio-environmental research: components, connections, scale, and context. *Ecology and Society*, 23(3).

Watch following three videos from SESYNC about Socio-Environmental framework and its application (Mandatory)

<https://www.sesync.org/for-you/educator/teaching-resources/introduction-to-socio-environmental-synthesis-series> .

As a part of the case study, you will learn the concept of socio-environmental systems and apply this to analyze socio-environmental systems of one horned rhinoceros conservation in Nepal to develop key skills that can be also applied analyzing other socio-environmental systems. In this activity, you will explore what are the key system components; how are those components linked; are those linkages among components positive or negative and what is the potential for feedbacks among components?

<https://bit.ly/2ttCWkU> (Read this to get more information about community based conservation in Chitwan); <https://bit.ly/2OqAjr5> (Read this which will provide dark side of rhinoceros conservation in Nepal)

Class Activity (a)

You will read mandatory pre-class reading. Based on the reading and previous module, you will work in a group of 2-3 to construct a concept map of socio-environmental components related to conservation issues and recovery of rhinoceros in Nepal. Concept map of each group must include at least four social and four ecological components. Then, all groups come to gather and share their components of the system and discuss whether all the socio-environmental components are identified.

Class Activity (b)

After mapping socio-environmental components, each group will add directionally explicit connections between component on your concept maps for explaining interactions and feedbacks between the components. Then, all the groups come to gather to critically analyze and explain their connection and prepare a final SES map.

Class Activity (c) (Homework)

Each student writes a page of reflection in which they synthesize their insight and critical review of their learnings from readings and class discussion. These reflections are intended to be an opportunity for students to track the evolution of the student's thinking throughout their learnings.

Module 3- Analyzing one-horned rhinoceros conservation challenges and potential solution using Driver-Pressure-Status-Impact-Response (DPSIR) analysis framework

Pre-class readings

Oesterwind, D., Rau, A., & Zaiko, A. (2016). Drivers and pressures—untangling the terms commonly used in marine science and policy. *Journal of Environmental Management*, 181, 8-15.

Rastogi, A., Hickey, G. M., Badola, R., & Hussain, S. A. (2012). Saving the superstar: a review of the social factors affecting tiger conservation in India. *Journal of Environmental Management*, 113, 328-340.

You will learn concept of DPSIR and apply this framework to analyze conservation challenges and associated response/interventions to address conservation challenges through collaborative learning.

Class Activity (a)

You will read the two pre class readings. Based on these readings and previous module, you will work in a group (of 2 individuals) to select at least two social challenges and two ecological challenges of rhino conservation in Nepal and identify and describe driver, pressure, state, impact and responses (DPSIR) related to selected challenges.

Class Activity (b)

After completing DPSIR analysis, all groups come to gather and critically analyze and explain their DPSIR, and prepare a final DPSIR table.

Class Activity (c) (Homework)

Each group then will write up a 2-page memo explaining key drivers and pressures and key element of successful conservation of rhinoceros based on your DPSIR analysis.