Teaching Notes:

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

Author Information:

Anil Shrestha, Faculty of Forestry, University of British Columbia, Vancouver

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

Acknowledgements

This work was supported by the National Socio-Environmental Synthesis Center (SESYNC) under funding received from the National Science Foundation DBI-1639145.

Table of Contents

Summary:
One of the grand challenge that humanity has been facing now is the unprecedented loss of biodiversity that are essential for our survival. Recently Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) warned the dire situation of risk of extinction of one million species from the planet because of habitat loss, fragmentation, poaching and human wildlife conflicts to name a few. Amid this grim situation, small country like Nepal managed to bring back an almost extinct one-horned rhinoceros from brink of extinction. In this case study, student will (1) be introduced to status of one horned rhinoceros population in Nepal, drivers of population decline and key policy and practical interventions to address those challenges (2) identify and describe socio-environmental components and explain their complex interaction and feedbacks (3) Apply SES framework to analyze challenges of rhino conservation and responses to address those challenges in Nepal. This case study is designed for an upper level undergraduate and graduate course with emphasis in conservation biology and policy.

Socio-Environmental Synthesis Learning Goals:

- Understand the structure and behavior of Socio-Environmental Systems (Module 1 and 2)
- Find, analyze, and synthesize existing data, ideas, or methods (Module 2 and 3)
- Consider the importance of scale and context in addressing Socio-Environmental Problems (Module 2 and 3)

Estimated Time Frame:
Completing all the components of this case study should take about four 60 minutes class period. This does not include out of the classroom readings and final memo writing.

Setting up the Scene (Hook)

In the hallway of beautiful Forest mall at the University of British Columbia, Vancouver, two friends Emily and Cara met after summer break. Emily is studying M.Sc. in biodiversity conservation at Faculty of forestry. Cara on the other hand is studying M.Sc. in nature and conservation Faculty of Forestry.

Cara: Hey Emily, how was your summer break…?

Emily: I had good time, but you see I am a bit worried, have you been following the news?

Cara: What was it about?

Emily: Oh guss, are you sure, where in earth you are? All the major news outlets, social media and newspapers have been referring to the recently published IPBES report which claims one million species at risks of extinction. They were talking about sixth mass extinction, our future generation will not be able to see these magnificent wildlife that are very important for our survival…What is happening….cant' stop thinking about the news.

https://www.youtube.com/watch?v=AOY01YqCYCY (CBC news about IPBES report)

Cara: Hey, I can understand what you have been going through. But believe me, this is not so doom and gloom. There are also some good news out there, which keeps us positive and hopeful for conservation of species, ecosystem and biodiversity and ultimately "the humanity".

Have you ever heard about one horned rhinoceros (*Rhinoceros unicornis*)? This species was almost extinct during 1960s throughout its range in South Asia. But due to decades of conservation efforts, now they come back particularly in India and Nepal. Their population has been increasing, they are thriving well. So much so, indigenous community and local people are getting benefits making their livelihood and co-existing together.

Module 1: Introduction to Socio-Environmental Aspect of One-horned Rhinoceros Conservation in Nepal

Learning objectives

- *Identify and describe status of one horned rhinoceros population overtime*
- *Identify and describe different stakeholders involved in rhino conservation in Nepal*
- *Describe drivers of rhino population decline in Nepal*
- *Explain policy and practices taken to address rhino conservation challenges 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.

This paper provides trends of one horned rhinoceros population in Nepal along with different conservation policy and practices adapted for recovery of rhino population in Nepal. Therefore, this paper will introduce students about the rhino conservation challenges, adopted policies and practices and future challenges for long-term conservation of rhino in Nepal.

Lamichhane, B. R., Persoon, G. A., Leirs, H., Poudel, S., Subedi, N., Pokheral, C. P., & De Iongh, 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.

Student will learn about human wildlife conflict and how community based conservations activities such as buffer zone helps to reduce human wildlife conflict and change the local people's attitude toward wildlife conservation in Chitwan National Park, which consist of the largest population of rhino in Nepal.

Conservation Crisis of One-horned rhinoceros in Nepal

One-horned rhinoceros (*Rhinoceros unicornis*) is one of the five extant species of rhino, which believed to be evolved during Pleistocene. During the early 19th century, scientist estimated half a million one horned rhinoceros individuals 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. However, a significant area of prime habitat of rhinoceros has been degraded or lost when their prime habitat in Gangetic plain were first opened to agriculture and human settlement ~ 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. This Situation 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. Due to habitat destruction and poaching, once distributed throughout lowland of Nepal, rhino population restricted only in Chitwan valley. Their number plummeted to less than 100 in 1970s. Situation was also similar in India, where only less than 100 individuals restricted in disjunct populations while rhinoceros 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 only initiated 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. This conservation model followed Fortress conservation approach, in which indigenous and local community evicted and relocated from their traditional land and they were restricted from using natural resources, in which they were dependent upon. As a result, there was park and people conflict that hindered and slowed down the 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 during1986 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, to gain public support restricted collection of natural resources such as grass, fuelwood and NTFP were

allowed for few days in a year in Chitwan National Park during 1976. Thus, people centered approach was initiated during these time. However, it was only during 1990s, community-based conservation was in full swing 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 myriads of conservation activities that boost conservation of endangered species such as rhino and their habitat. This along with stringent patrolling and monitoring led to increase in rhino population from less than 100 to 544 in Chitwan national park during 2000. However, due to decades of Maoist civil war, rhino population plummeted to ~400 again from 2000 to 2006. After the civil war, community-based conservation along with community based anti-poaching unit as well as involvement of army 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 local community along with stringent protection and monitoring helped to restore rhino population from extinction in Nepal.

Class plan

The purpose of this module is to introduce students about one horned rhinoceros conservation issues including drivers of its population decline in Nepal and how Nepal brings back once almost extinct species to successful recovery by analyzing complex socio-environmental issues. The instructor will present a power-point (included in the course package) to introduce the issues and various concerted mechanisms implemented to restore declining population of rhino in Nepal. Apart from presentation, student must complete pre-class reading for better understanding of the issues. By doing so, student will start to identify and describe the socio-environmental system evolve around the rhino conservation.

Student activities

a) (30 minutes) After instructor's presentation and mandatory pre-class reading, student will discuss in a group (not more than 3 individuals) questioning about drivers of rhino population decline, various stakeholders involved, pros and cons of conservation approach (fortress and community based) and most importantly analyzing various mechanisms (policy, socio-economic and ecological efforts) introduced and implemented for conservation of rhino.

b) (30 minutes) After discussion, each group will come to gather and share their outcomes with other groups and synthesize key drivers, key stakeholders, various

mechanisms and analyzed what worked and what did not work and why for conservation of rhinoceros in Nepal.

This module should take 90 minutes (30 minutes instructor's presentation and 30 minutes class discussion within group and 30 minutes between the groups)

Optional

Each group can write a page about their synthesis on key drivers, key stakeholders, various mechanisms what worked and what did not work and why for conservation of rhinoceros in Nepal.

Module 2: SES thinking framework for the case

Learning Objectives

- Identify and describe socio-environmental components of rhino conservation system
- Identify and explain interactions and feedbacks in the socio-environmental system of rhino conservation system
- Enhance evidence-based argument skills

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).

This key paper will introduce students how SES framework can be used for analyzing complex issues of endangered species conservation with two cases (tiger in Nepal and Giant panda in China). Students should use this framework as a reference to analyze and expand socio-environmental systems of rhino conservation in Nepal.

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).

Class plan

After knowing the overall issues and policy/practical responses in Module 1, the purpose of this module is to introduce students about socio-environmental components of the system and their interaction related to conservation of one-horned rhino in Nepal

by constructing concept maps. A short introduction about concepts on SES framework is recommended by the instructor. Student will watch three videos before the class that will provide introduction to SES framework https://www.sesync.org/for-you/educator/teaching-resources/introduction-to-socio-environmental-synthesis-series Instructor facilitates the student activities when needed.

Student activities

a) (30 minutes) Students complete the mandatory pre-class reading and watch three videos prior to the class. Based on these reading and videos, student will work in a groups of 2-3 to construct a concept map of socio-environmental components related to conservation issues and recovery of rhinoceros in Nepal. Here, each group needs to include at least four social and four ecological components (15 minutes). Then, all groups come to gather and share their components of the system and discuss whether all the socio-environmental components were identified and described (15 minutes).
b) (30 minutes) After mapping socio-environmental components, each group will add directionally explicit connection on their concept maps for explaining interactions and feedbacks between the components (10 minutes). Then, all the groups come to gather to critically analyze and explain their connection, and prepare a final SES map (20 minutes).
c) 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 policy and practical responses using Driver-Pressure-Status-Impact-Response (DPSIR) analysis framework

Learning objectives

- Identify and describe DPSIR framework
- Apply DPSIR framework to explain complex rhino conservation challenges and related policy and practical intervention to address those challenges
- Enhance evidence based argument skills

Pre-class reading

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.

Students will learn about the different terms and concept of DPSIR and will gain insight on how to use DPSIR to analyze complex Socio-Environmental system.

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.

From this paper, students will learn how to use DPSIR framework for analysis of conservation challenges of endangered tiger species in India.

Class plan

In this module, student will use DPSIR framework to analyze one-horned rhinoceros conservation challenges and synthesize potential solutions/responses based on the available literatures and discussions. Instructor is encouraged to provide a short introduction on the concept and application of DPSIR framework before students start their activities. Instructor should facilitate the student activities and discussions.

Student activities

a) (30 minutes) Students complete the two pre class readings. Based on these readings, student 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 driver, pressure, state, impact and responses related to selected challenges.
b) (30 minutes) After completing DPSIR analysis, all groups come to gather and critically analyze and explain their DPSIR, and prepare a final DPSIR table.
c) Each student group write up a not more than 2 pages memo explaining key drivers and pressures and key element of successful conservation of threatened species such as rhinoceros based on their DPSIR analysis **(homework)**.