Strategic Planning Workshop

Improving Wildlife Health Capacity in Nepal

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Cover photo: Veterinary work on a tranquilized rhino.
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Workshop participants. © Agriculture and Forestry University.

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Prof. Dr. I.P. Dhakal, AFU and Dr. Joseph Gaydos, UC Davis

Abbreviations and acronyms

AFU	Agriculture and Forestry University
AHD	Animal Health Directorate
AHTCS	Animal Health Training and Consultancy Service
CMDN	Centre for Molecular Dynamics Nepal
DLS	Department of Livestock Services
DLSO	District Livestock Services Office
DNPWC	Department of National Parks and Wildlife Conservation
EDCD	Epidemiology and Disease Control Division
FAO	Food and Agriculture Organisation
HICAST	Himalayan College of Agricultural Sciences and Technology
IEC	Information, Education and Communication
MoFSC	Ministry of Forests and Soil Conservation
NARC	National Agricultural Research Council
NGO	Non-governmental Organization
NTNC	National Trust for Nature Conservation
NVC	Nepal Veterinary Council
NZFHRC	National Zoonoses and Food Hygiene Research Centre
TOT	Training of Trainers
UC	University of California
USAID	United States Agency for International Development
VIEW	Veterinary Initiative for Endangered Wildlife
WWF	World Wildlife Fund

Contents

1. Background

Nepal is endowed with rich biodiversity. About 60% of Nepal's tourists visit protected areas for trekking and or watching wildlife. The country boasts 10 national parks, four wildlife reserves and six conservation areas, occupying over 34,185 square kilometers or 23.3 percent of the country's total land area. Chitwan National Park and Bardia National Park are renowned for conservation of the endangered greater one-horned rhinoceros and Bengal tiger. Many national and international agencies and non-governmental organizations (NGOs) have long supported wildlife conservation and management in Nepal and copious studies on wildlife and their ecology have been published. Wildlife health and wildlife diseases, however, have been given much less attention.

Changing climate and increasing globalization have greatly increased disease threats to wildlife as well as the transmission of diseases from wildlife to domestic animals and humans. Simple awareness and training are not enough to address the diverse wildlife health issues facing Nepal. Instead, we need to develop a comprehensive national strategy that can address wildlife health issues on a broad perspective including: amendments or improvements to current wildlife and health laws; education and training; identifying and addressing major diseases shared between people. livestock and wildlife; wildlife health issues in wildlife trade; and captive animal and metapopulation management. In light of this need, a three-day strategic planning workshop was organized to identify current wildlife health issues and needs, as well as strategies to address them.

2. Brief summary of the workshop program

The workshop was organized from 6 to 8 February, 2016 at the National Trust for Nature Conservation (NTNC) in Sauraha, Chitwan. Day 1 included an inaugural session and reception dinner for all participants. Day 2 had scientific presentations and breakout sessions, and day 3 continued with the breakout sessions, plenary sessions and a forward-looking closing session.

Inaugural session

The Honorable Minister Mr. Agni Prasad Sapkota, Ministry of Forest and Soil Conservation (MoFSC), was the chief guest of the inaugural session. Dr. Uday Chandra Thakur, Secretary for MoFSC, Mr. Fanindra Raj Kharel, Director General of the Department of National Parks and Wildlife Conservation (DNPWC) also addressed the inaugural session. The inaugural program was attended by high level government officials from the ministry; the workshop coordinator Prof. Dr. IP Dhakal, Vice Chancellor of Agriculture and Forestry University (AFU) along with other faculty members interested in wildlife diseases; professors working on wildlife health from the UC Davis, USA and Royal Veterinary College, UK; wildlife disease experts; USAID staff; nature conservationists and ecologists from the Hariyo Ban Program and World Wildlife Fund (WWF); representatives from the Nepal Agricultural Research Council (NARC), Nepal Veterinary Council (NVC), Food and Agricultural Organization (FAO), National Trust for Nature Conservation (NTNC); participants from the Center for Molecular Dynamics, Nepal (CMDN); and others.

The workshop coordinator welcomed the guests, Dr. Joseph Gaydos from UC Davis presented the overview goal of the meeting, Mr Dibesh Karmacharya from CMDN highlighted the importance of wildlife disease research from a One Health Perspective, and Dr. Richard Kock from Royal Veterinary College delivered a key note address entitled "Benefits of improving wildlife health in Nepal". Dr. Govinda Gajurel, Member Secretary of NTNC, Dr Baburam Marasini, Director of the Epidemiology and Disease Control Division, Ministry of Health and Contagious Diseases and Bronwyn Llewellyn, Environment team Leader, USAID made brief remarks and expressed good wishes for the success of the workshop. Secretary Dr. Uday Chandra Thakur and Honorable Minister Mr Agni Prasad Sapkota expressed their strong support for implementing the outcomes of the workshop and their hopes for the success of the meeting. Ms. Judy Oglethorpe from WWF, Hariyo Ban delivered the vote of thanks. The chairperson of the session, Mr. Fanindra Raj Kharel, ended the session with concluding remarks. Dr. Bhuminand Devkota from AFU anchored the inaugural program.

Plenary sessions

i. Scientific presentation session

i) Keynote address "One Health Applied to Wildlife Conservation" by Dr. Christine Johnson from the UC Davis School of Veterinary Medicine.
ii) The Threat of Diseases to Endangered Wildlife by Dr. Joseph Gaydos.
iii) Wildlife Policy in Relation to Wildlife Health in Nepal by Dr. Kamal Prasad Gaire and Mr. Ram Chandra Kandel.
iv) Surveillance of Influenza A in Migratory Birds of Nepal by Dr. Sulochana Manandhar.
v) Review of Wildlife Health Capacity Assessment in Nepal by Prof. I.P. Dhakal & Dr. Joseph Gaydos.
vi) Wildlife-Human Conflict in Relation to Health by Dr. Chiran Pokhrel & Dr. Maheshwar Dhakal.
vii) Wildlife Trade and Disease Challenges by Diwakar Chapagain.
viii) Tuberculosis of Macaques by Dr. Swoyam Prakash Shrestha.
ix) Canine Distemper Virus in Dogs and Wildlife by Dr. Sarah Vallentine.

Breakout sessions

The goal of the breakout sessions was for groups to discuss key topics, create a list of the problems and potential solutions, and where possible, to estimate costs for addressing the problems. The impact of climate change was included in each of these topics. Each participant was asked to choose or was assigned to a breakout group, and each group had one person to lead and facilitate the conversation. Four groups were formed with the following topics:

- Education and training to improve veterinary support for endangered wildlife
- Major diseases to address that will benefit human, livestock and wildlife health
- Controlling wildlife trade
- Captive animal management (capture, transport, housing)

The summaries from the group discussions are presented in the following pages.

Group A. Education and training to improve veterinary support for endangered wildlife

Facilitator: Prof. Dr. Naba Raj Devkota and Dr. Christine Johnson
Rapporteur: Dr. Bhuminand Devkota, Dr. Doj Raj Khanal and Dr. Barun Sharma

Problems to be addressed and potential solutions

A) Overarching Issues

1. Lack of awareness among general public on eco-health

Solution

- Create awareness through mass media, community forestry user groups and other means of communication

2. No curricula to address zoo and wildlife health at undergraduate level

Solution

- Develop curricula on wildlife diseases and management for undergraduates

3. Inadequate existing rules, regulations and acts supporting wildlife health

Solution

- Formulate new and amend existing rules, regulations and acts concerning wildlife health (see Group B, problem A for a similar recommendation)

4. Lack of training/inadequate knowledge in capture, sampling, handling, surveillance, wildlife disease ecology, diagnostics, treatment and control

Solutions

- Provide training (short, long-term and refresher) for licensed veterinarians (needs include capture and handling, surveillance and sampling, diagnosis, treatment and control)
- Develop training of trainers (TOT) on wildlife health and management

5. Lack of well-equipped lab for addressing wildlife disease issues

Solution

- Establish a well-equipped lab with trained personnel at national level

6. Lack of identified focal institutions responsible for wildlife health

Solution

- Identify and designate focal institutions for wildlife health solutions with clear responsibilities; this could include a national university.

7. No separate division to address wildlife and conservation medicine

Solution

- Establish a Wildlife Health and Management Department/Division in Academia and a similar division under the jurisdiction of a veterinarian at DNPWC or MoFSC.

B) Issues of climate change

- Change in vector ecology
- Alterations in disease ecology
- Effects on reproductive behavior

C) Capacity building needs

- Human resources development
- Infrastructure development
- Legal backstopping and political commitment
- Community and local stakeholder support
- Donor support
- Formation of a coordination committee for advocacy and follow up

Budget (Total estimate US$11 million)

About $10 million is required for capacity building for human and infrastructure development, equipment, transport and training the respective units. Additionally, supporting ongoing training of postgraduates in wildlife health is needed to service an estimated attrition rate of 1 staff per year from the core unit and service NGO, and other needs. This would cost about $40000 to set up the curriculum, with ongoing costs of about $10000 per year to maintain this course. Staffing could be part funded from fees but for stability an endowment at about $1 million could help to establish a professorship, and equip and provide admin for the course.

Group B. Major diseases to address that will benefit human, livestock and wildlife health

Facilitators: Dr. Gretchen Kaufman and Dr. Joseph Gaydos
Rapporteurs: Dr. Khadak Singh Bist and Dr. Rebanta Kumar Bhattarai

Problems to be addressed and potential solutions

A) Overarching Issues

1. Lack of government policy to address wildlife health

Solutions

- Amend the existing Animal Health Act to include wildlife health and disease including the following wildlife health policy provisions:

    - Veterinarians working for National Parks have authority to investigate all wildlife diseases and are required to report potential impact to human and domestic animal health departments (500,000 to 1,000,000 NR/year/vet)
    - Requirement for domestic animal and human health departments to work with National Parks if disease could impact wildlife
    - Mandatory investigation of all wildlife mortality events
    - All authority for wildlife health would go to the veterinarians so they would not have to ask for permission to act (this would include the authority to euthanize based on disease diagnosis if necessary)
- Amend the Conservation Act to include and spell out the need to address wildlife health through:
    - Requirement for disease surveillance
    - Requirement for health monitoring and surveillance
    - Asking the national parks authority to establish disease priorities for wildlife health and suggest priorities be re-evaluated periodically (say every 5 years)
    - Considering a joint committee between human, domestic animal and wildlife health priorities

2. Lack of institutional capacity in wildlife health

Solutions

- Request increase in human resources at the level of DNPWC (at one time there were 14 vets at national parks, but that failed to continue)
- Provide a clear mandate and authority to the vets
- Provide opportunities for career development (where do they go from here; look at the Department of Livestock to model a promotion structure - use the same system but be careful to not REQUIRE people to be promoted out of a certain class if they don't desire that)
- Wildlife veterinarians (need to establish that these are qualified veterinarians) need to report to DNPWC, NOT to the Departments of Livestock Health or Human Health (and have a link at the national level to the Chief Veterinary Officer of the Country). Hire people that want to stay in wildlife.
- Include hospital (50,000,000 NR), laboratory (50,000,000 NR), vehicle (800,000 NR), operating budget for fuel, drugs, supplies, etc. (10,000,000 / year for operating hospital)
- Ensure staffing for hospital and laboratory
- Begin with at least one to three veterinary hospitals (Chitwan, Bardia, and in the hills), then eventually consider creating a clinical facility in each conservation area (for sample collection, storage, etc.)
- Propose having a rapid response team at each hospital (could handle clinical services, bio surveillance, and postmortem diagnostics)
- Must have facilities for temporary holding of animals

3. Need for a reporting framework across agencies, including a database

Solution

- Require the new Wildlife Health Division in DNPWC to communicate with Departments of Livestock Health and Human Health

4. Capacity to perform disease diagnosis (diagnostic capacity)

Solutions

- Increase universities' or the Central Veterinary Laboratory's budget to be able to handle testing of submitted wildlife samples (staff, reagents, space, etc.); this should include increasing capacity for cytology and histopathology with wildlife experience or expertise. There will likely be a need for some diagnostic work to be done by the Wildlife Veterinary Hospital (probably for diseases specific to wildlife), while other samples will be sent to the Central Veterinary Laboratory.
- Prioritize which diseases for which we want to have laboratory diagnostic capabilities

5. Low capacity to understand disease epidemiology

Solutions

- Provide universities with capacity to set up a unit for research into wildlife diseases
- Arrange for veterinarians in national parks to assist with research

6. Vaccine supplies not always available for diseases of interest (primarily vaccines for domestic animals)

Solutions

- When vaccination is part of the solution (say routine vaccination in the buffer zones), ensure that adequate vaccine supplies are available
- Stockpile vaccines for emergencies as relevant

B) High Priority Diseases

These are diseases that:

- impact humans, domestic livestock and wildlife, or
- have a major impact or potential to impact endangered species from a conservation perspective

Potential Diseases of Importance:

1. Rabies
2. Avian influenza
3. Tuberculosis
4. Foot and mouth disease
5. Peste de petits ruminants
6. Canine distemper virus
7. Parvovirus
8. Anthrax
9. Leptospirosis
10. Brucellosis
11. Classical swine fever
12. Toxoplasmosis
13. Japanese encephalitis
14. Newcastle disease
15. Elephant endotheliotropic herpes virus
16. Trypanosomiasis
17. Anaplasma
18. Babesia
19. Ehrlichia
20. Theileria
21. Bluetongue
22. Hemorrhagic septicemia
23. Aquatic diseases

Solutions

- Develop a clear, legal One-Health Platform that includes standard operating procedures for control, including a clear understanding of responsibilities and how information is going to be shared across all sectors involved (human, domestic animal and wildlife components)
- Use the existing response protocol (identified teams for humans, domestic animals and wildlife)
- Build laboratory capacity
- Undertake active surveillance, including environmental parameters and potential climate change effects
- Develop/enhance clear understanding of the epidemiology in humans, domestic animals and wildlife (including an understanding of the potential changes to be expected with climate change)
- Ensure adequate resources for all these needs

Budget (total estimate $5 million)

This amount is required to establish a Wildlife Health Division with a staff of 6 vets and 6 support staff to support the national parks and wildlife estate – including infrastructure, equipment, transport and training, with an annual operating budget of about $250,000 to cover salaries, day to day costs etc., provided through the overall DNPWC budget. Costs associated with major outbreaks and diagnostics would need special provision.

Group C. Controlling wildlife trade

Facilitator: Dr. Diwakar Chapagain and Dr. Naresh Subedi
Rapporteur: Dr. K.B. Shrestha and Ms. Manisha Bista

Problems to be addressed and potential solutions

A) Overarching Issues:

- Nepal is a transit and conduit route for wildlife trade
- There are challenges in identification of species or animal parts as well as the sources of the wildlife being traded
- There is a lack of a comprehensive wildlife trade policy in Nepal
- There is inadequate data on the role of wildlife trade in transmitting diseases
- There are not enough quarantine facilities and the existing ones are in poor condition
- There is a lack of wildlife rehabilitation centers for placement of live confiscated animals

Solutions (general)

- Promote trans-boundary and in-country cooperation among the concerned agencies
- Improve education of judiciaries and customs officers involved in controlling wildlife trade
- Improve training in identification of wildlife parts including both macro and molecular level

- Investigate possibility of screening traded wildlife parts for disease
- Develop a centralized database for wildlife trade (live and parts)
- Promote information, education and communication (IEC) for people living near wildlife areas to help minimize wildlife trade
- Improve quarantine facilities (forensics, human resources, and proper disposal of confiscated materials)
- Establish facilities and trained human resources for rehabilitation of live wild animals confiscated from illegal traders

B) Addressing climate change

Solutions

- Avoid releasing animals into new areas without necessary precautions due to the risk of disease spread
- Increase vigilance for poaching during times of climatic livelihood hardship

C) Building capacity

Solutions

- Train wildlife trade enforcement officers
- Train customs officials in basic wildlife parts identification
- Build forensic cells in customs offices
- Build a centralized database management system
- Train veterinarians in customs activities
- Train sniffer dogs for regional airports and major borders
- Include wildlife trade in veterinary curricula at the undergraduate level
- Train people in wildlife rehabilitation (field technicians)

Budget (total estimate $1.5 million)

This amount is required for:

- Staff, training and facilities on a regional level (5 sites) to deal with border trade, confiscation, quarantine and rehabilitation. A part of the core unit, perhaps in Chitwan, would include facilities for injured and abandoned wild animals, and absorb some of the long term needs of captive wildlife
- Enhancing wildlife trade control in 14 customs offices at different border points in Nepal
- Quarantine facilities at all points
- Waste disposal at all points
- A forensic facility (central level)
- Human resources (customs officers, sniffer dogs, field technicians, forensic scientists, waste management technicians, poaching hotline support, enforcement officers, training for all groups)

Group D. Captive animal management (capture, transport, housing)

Facilitator: Dr. Richard Kock & Dr. Deborah McCauley
Rapporteur: Dr. Dipesh KC, Dr. Amir Sadaula and Dr. Suraj Subedi

Problems to be addressed

A) Overarching challenges

- Problem animals and captive facilities (tiger-human conflict)
- Management of metapopulations
- Confiscated live animals being illegally traded
- Commercial wildlife breeding
- Policy and legislation inadequacies

B) Important species

- Rhino, tiger, leopard, civet, wild boar, marsh mugger, birds, deer, pangolins, pythons, etc.
- Sources include national parks, community, human-wildlife conflict situations (example of leopard human-wildlife conflict around Kathmandu)

C) Specific issues

- Crop depredation and human/livestock injury
- Inadequate law regarding re-release of wildlife – e.g. what about leopard from human-wildlife conflict?
- Fate of problem animals such as man-eating tigers or leopards beyond the few that can be taken by the zoo
- Fate of animals bred at the zoo
- Availability of suitable drugs, equipment and proper logistics; lack of laws for acquiring, keeping and using narcotics
- Lack of quarantine facilities and sanitation and hygiene for animals

Solutions

- Develop a prepared wildlife health team embedded in government that can deal with problem animals
- Ensure basic laboratory support for diagnostics on problem and captive animals
- Harmonize policy to import, keep and use drugs, including narcotics
- Discuss euthanasia issue
- Develop a protocol for capture, transport, housing and welfare of captured animals
- Take a cross-sectoral approach and ensure regular meetings (One Health Approach)
- Set up a wildlife unit within Government, or an NGO like NTNC
- Develop science and policy for potential release of rehabilitated animals to the wild; focus on minimizing risk

Note on human-wildlife conflict: is reducing human-wildlife conflict a role for wildlife health? This is probably more of an issue between national parks and agriculture.

D) Capacity needs

- Create a Wildlife Health Division
- Train young veterinarians and field veterinarians
- Provide specialized training to trainers
- Promote external training (MS, PhD, etc.)
- Establish high standards of practice: strong evidence-based wildlife veterinary medicine, data collection, analysis, review, and communication with stakeholders.

Budget (total estimate: $6 million)

This amount will be required for:

- Improving capture techniques, transport and housing facilities at the regional levels
- Providing staff, training them and providing facilities on a regional level to cover some of the long term needs of captive wildlife

Closing session

Closing thoughts and plan development

Dr. Richard Kock, Facilitator

Important Points

- How can we support the government and non-governmental sector to ensure that the outcome is a good one?
- We know the government is going to do this, but what recommendations can we provide that will ensure that there is success?

Mechanisms for influence

- A national strategy on wildlife health should be developed, building on the workshop outcomes, with approval by government
- Ultimately there needs to be buy-in from the government - perhaps the Secretary of the MoFSC
- The Hariyo Ban Program's working group under its Program Steering Committee could be an important player in helping ensure government buy-in
- We need some key individuals who can advocate for moving a plan into action
- Nepal has a National Biodiversity Strategy and Action Plan. As well, the Convention on Biological Diversity produced a document on health and biodiversity - perhaps we can develop a national framework that plays off this and focuses on wildlife health (in the larger sense, as opposed to zoonosis or diseases of wildlife and domestic animals). While this is focused on wildlife, it needs to be clear that there will be economic benefits, human health benefits, and domestic animal benefits in addition to wildlife conservation benefits.
- There is a bill under consideration with the Wildlife and Conservation Act. Now is the time to speak to parliament members. There are specific recommendations from Group B that explain some needed changes to the Conservation Act as well as to the Animal Health Act.
- The Government needs to be willing to invest in wildlife health. We cannot just depend on donor aid funding

- The government currently does have money for and interest in wildlife health; USAID is trying to work on public financial management with the government of Nepal to improve budget execution (current rates might be approximately 20%). It might be possible to get international support to get a program established, and then ask the government to pick it up.

Creation of a strategy document from this meeting (which is sort of an expert opinion) would be a first step to a national strategy on wildlife health. Data are needed to support this strategy. How can we use our research capacities within the universities (maybe with help of international natural resource economists) to look at some of the economic benefits of the proposed strategies and use this to back up the strategy document we produce? Can we set some data needs?

Early steps that can be taken now

- Develop curricula that incorporate wildlife health into veterinary training
- Look at early education training that exists to see where wildlife health can be incorporated into those curricula

3. Conclusions and recommendations

Wildlife health is an important issue for the conservation of wildlife itself. Moreover, it has a huge impact on disease ecology including domestic animals and human health. In Nepal, attempts have been made in the past to diagnose and treat important zoonotic diseases that infect wildlife, domestic animals and humans. In the workshop the wildlife health issues in Nepal were discussed in a broader perspective focusing on the existing situation of wildlife health education and training; major diseases to address that will benefit human, livestock and wildlife health; wildlife health issues in wildlife trade; and captive animal and metapopulation management. While doing so, the workshop identified major problems, proposed potential solutions, and estimated the cost involved.

Overall, the workshop came up with the following recommendations for the way forward for improving wildlife health in Nepal. Regarding the financial part and the execution of the strategy, the government of Nepal should have a strong willingness to invest in wildlife health, and donor agencies can be identified and persuaded to support the mission.

1. **Strengthen education and training to improve veterinary support for endangered wildlife (total budget estimate: $11 million)**
   - i) Create awareness through mass media, community forest user groups and other means of communication
   - ii) Develop curricula on wildlife disease and management for undergraduates that can train and introduce students to one health, eco-health and wildlife health; some that have a keen interest will come forward for further training
   - iii) Formulate new and amend existing rules, regulations and acts in wildlife health
   - iv) Develop training packages (short- and long-term and refresher) for licensed veterinarians that include capture and handling, surveillance and sampling, diagnosis, treatment and control of zoonotic diseases
   - v) Develop TOT on wildlife health and management
   - vi) Establish well equipped labs with trained personnel in universities and national parks
   - vii) Identify and designate focal institutions for wildlife health with clear responsibilities (could include a national university)
   - viii) Establish a Wildlife Health and Management Department in academia and a similar division under the jurisdiction DNPWC
   - ix) Address the issues of climate change by studying changes in vector ecology, alterations in disease ecology and effects on reproductive behavior
   - x) Invest in capacity building through human resources development, infrastructure development, legal backstopping, political commitment, community and local stakeholder support, and donor support

2. **Address the major diseases that will benefit human, livestock and wildlife health (total budget estimate: $5 million)**
   - i) Amend the existing Animal Health Act to include wildlife health and disease. This this should include giving authority to veterinarians working for National Parks to investigate all wildlife diseases; requiring them to report potential impacts to human and domestic animal health departments; requiring human and domestic animal health departments to work with DNPWC if disease might impact wildlife;

mandating investigation of all wildlife mortality events; and vesting all authority for wildlife health in national park veterinarians so they do not have to ask for permission to act (this would include the authority to euthanize based on health diagnosis if necessary).

ii) Amend the Conservation Act to include and spell out the need to address wildlife health, requiring disease surveillance, health monitoring and surveillance, and establishing disease priorities for wildlife health; suggest priority diseases be re-evaluated periodically (e.g. every 5 years)

iii) Consider a joint committee between human, domestic animal and wildlife health authorities to work on disease priorities

iv) Increase veterinary staff in the Department of National Parks (at one time there were 14 vets at national parks, but that failed to continue). Provide a clear mandate and authority to the vets and provide opportunities for career development and their promotion.

v) Promote networking by wildlife veterinarians (need to establish that these are qualified veterinarians) who should report to DNPWC, NOT to the Departments of Livestock Health or Human Health (and they should have a link at the national level to the Chief Veterinary Officer of the country)

vi) Include hospital (50,000,000 NR), laboratory (50,000,000 NR), vehicle (800,000 NR), operating budget for fuel, drugs, supplies, etc. (10,000,000/year operating budget for hospital). Staff for hospital and laboratory should be recruited. Begin with at least one to three veterinary hospitals (Chitwan, Bardia, and in the hills), then eventually consider creating a clinical facility in each conservation area (for sample collection, storage, etc.). There should be a rapid response team at each hospital (could handle clinical services, bio surveillance, and postmortem diagnostics). Hospital must have facilities for temporary holding of animals.

vii) Require the new Wildlife Health Division in DNPWC to communicate with Departments of Livestock Health and Human Health.

viii) Increase the budgets of the AFU laboratory and the Central Veterinary Lab so they can handle testing of wildlife samples (staff, reagents, space, etc.). This should include increasing capacity for cytology, histopathology and molecular diagnostics with wildlife experience or expertise. There will likely be a need for some diagnostic work to be done by the Wildlife Veterinary Hospital (likely focusing on diseases specific to wildlife), while other samples will be sent to the AFU or Central Veterinary Laboratory. However, it is vitally important that disease investigation can be carried out immediately in the most appropriate regional veterinary laboratories. The AFU should be provided with capacity to set up a unit for research into wildlife diseases. Permission to collaborate with appropriate and approved international laboratories should be given while capacity is being developed in-country. This will help improve and confirm results of Nepal laboratories while capacity is being established.

ix) Address the need for permission to send samples to appropriate specialized laboratories for specific disease investigation abroad. For example, there are only a handful of laboratories internationally that can investigate *Mycoplasma pneumonia* in bighorn sheep. Wildlife veterinarians should have permission to submit biological samples to appropriate laboratories in-country and if they consider it necessary, permission for them to submit to laboratories abroad.

x) Ensure that national parks veterinarians also assist with research.

xi) Ensure that vaccines for diseases of interest are available (primarily of vaccines for domestic animals, for diseases that also impact wildlife)

xii) Identify high priority diseases that impact human, domestic and wildlife, especially endangered species - from a conservation perspective. A clear legal One-Health Platform should be created that includes standard operating procedures for control, including a clear understanding of responsibilities and how information is going to be shared between all sectors involved (human, domestic animal and wildlife components). Active surveillance should be carried out, including for environmental parameters and potential climate change effects. Clear understanding of the epidemiology in humans, domestic animals and wildlife (including an understanding of the potential effects of climate change) is important. Priority diseases will change with time. The newly formed Wildlife Health Division should be mandated to identify high-priority diseases on a routine basis, maybe every 5 years. Note that there always needs to be an allowance and understanding that emerging diseases will show up.

3. Controlling wildlife trade (total budget estimates: $1.5 million)

i) Establish trans-boundary and in-country cooperation among the concerned agencies.
ii) Ensure better education of judiciaries and customs officers involved in controlling wildlife trade. Improve training in wildlife part identification including at macro and molecular level.
iii) Develop a centralized database for wildlife trade (live animals and parts); promote IEC for people living near wildlife areas to help to minimize wildlife trade
iv) Improve quarantine facilities (for forensics, human resources, and instituting proper disposal of confiscated materials)
v) Establish wildlife rehabilitation facilities and train staff in wildlife rehabilitation
vi) Address climate change issues including avoiding releasing animals into new areas without due precautions, due to the risk of disease spread; increase vigilance for poaching during times of climatic livelihood hardship
vii) Increase capacity building by training wildlife trade enforcement officers and customs officials in basic wild animal parts identification. Build forensic cells in customs offices, train veterinarians in customs activities, train sniffer dogs for regional airports and major borders, include wildlife trade in veterinary curricula at undergraduate level, and train people in wildlife rehabilitation (field technicians)

4. Captive animal management (capture, transport and housing) (total budget estimate: $6 million)

i) Develop a prepared wildlife health team embedded in government that can deal with problem animals; the euthanasia issue needs to be discussed, and harmonization of policy to import, keep and use drugs
ii) Ensure basic laboratory support for diagnostics on problem and captive animals
iii) Develop and implement a protocol for capture, transport, housing and welfare of captured animals
iv) Set up a Wildlife Health Division within MoFSC/NTNC.
v) Establish a high standard of practice and standardized protocols of best practices for strong evidence-based wildlife veterinary medicine, data collection, analysis, review and communication with stakeholders.
vi) Strengthen Wildlife Health Database for disease surveillance, data collection and medical record keeping.

Final Note

During the workshop a committee was established to advise on the drafting of a National Wildlife Health Strategy for Nepal. Committee members are:

Dr. Maheshwar Dhakal, DNPWC
Dr. Dhan Raj Ratala, Chairperson, Nepal Veterinary Council
Dr. I.P. Dhakal, Agriculture and Forestry University
Dr. Shant Raj Jnawali, Hariyo Ban Program, WWF Nepal

Annex 1: List of workshop participants

SN	Last Name	First Name	Address	Location
1	Dhakal	Ishwari Prasad	Agriculture & Forestry University	Chitwan
2	Devkota	Naba Raj	Agriculture & Forestry University	Chitwan
3	Bhattarai	Rebanta	Agriculture & Forestry University	Chitwan
4	KC	Dipesh	Agriculture & Forestry University	Chitwan
5	Bhatta	Balaram	Agriculture & Forestry University	Hetauda
6	Devkota	Bhumi N.	Agriculture & Forestry University	Chitwan
7	Luitel	Himal	Agriculture & Forestry University	Chitwan
8	Kharel	Fanindra Raj	DG, DNPWC	Kathmandu
9	Subedi	Naresh	DNPWC	Kathmandu
10	Kandel	Ram Chandra	Warden DNPWC Saurah	Chitwan
11	Gaire	Kamal	DNPWC Saurah	Chitwan
12	Shrestha	Swoyam Prakash	NARC, Khumaltar	Lalitpur
13	Khanal	Doj Raj	NARC, Khumaltar	Lalitpur
14	Karki	Ram Kumar	DLSO Bharatpur	Chitwan
15	Oglethorpe	Judy	WWF	Kathmandu
16	Chapagain	Diwakar	WWF	Kathmandu
17	Gajurel	Govinda	Member Secretary NTNC	Kathmandu
18	Pokharel	Chiranjibi Prasad	NTNC Saurah	Chitwan
19	Sadaula	Amir	NTNC Saurah	Chitwan
20	Pradhan	Narendra	Bird Conservation Nepal	Kathmandu
21	Karmacharya	Dibesh	CMDN	Kathmandu
22	Manandhar	Sulochana	CMDN	Kathmandu
23	Marasini	Babu Ram	Director EDCD	Kathmandu
24	Rayamajhi	Nabin	Patan Academy of Health Sciences	Lalitpur
25	Shrestha	Krishna B.	Principal, HICAST	Kathmandu
26	Kock	Richard	Royal Veterinary College	UK
27	Kaufman	Gretchen	VIEW	USA
28	McCauley	Deborah	VIEW	USA
29	Gaydos	Joseph K	UC Davis	USA
30	Vallentine	Sarah	HIS	Kathmandu
31	Subedi	Suraj	One Health Epi. Fellow, NZFHRC	Kathmandu
32	Sharma	Barun	One Health Epi. Fellow, NZFHRC	Kathmandu
33	Shrestha	Chanda	One Health Epi. Fellow, NZFHRC	Kathmandu
34	Gupta	Binod	One Health Epi. Fellow, NZFHRC	Kathmandu
35	Bista	Manisha	One Health Epi. Fellow, NZFHRC	Kathmandu
36	Nepal	Swagat	One Health Epi. Fellow, NZFHRC	Kathmandu
37	Llewellyn	Bronwyn	USAID	Kathmandu
38	Upham	Karolyn	USAID	Kathmandu
39	Oli	Bishwa Nath	Joint Secretary MoFSC	Kathmandu

40	Thakur	Uday Chandra	Secretary MoFSC	Kathmandu
45	Bisht	Khadak Singh	FAO Office	Lalitpur
46	Bandyopadhyay	Santanu	FAO Office	Lalitpur
47	Parajuli	Baikuntha	FAO Office	Lalitpur
48	Ratala	Dhan Raj	NVC, Tripureshwor	Kathmandu
49	Sharma	Minu	NZFHRC	Kathmandu
50	Sapkota	Agni	Minister, MOFSC	Kathmandu