

Updated SAVE Blueprint for 2017

A Blueprint for the Recovery of South Asia's Critically Endangered *Gyps* Vultures



February 2014

(including January 2015, 16 & 17 additions)

The Current State of South Asia's Vultures

Twenty years ago there were tens of millions of vultures in the Indian subcontinent. They provided a valuable ecosystem service by disposing of millions of tonnes of waste carrion from dead cattle each year. Now they, and the services they provided, are nearly all gone. Three species of *Gyps* vultures endemic to South and Southeast Asia, oriental white-backed vulture (*Gyps bengalensis*), long-billed vulture (*G. indicus*) and slender-billed vulture (*G. tenuirostris*), are the worst affected and are threatened with global extinction after rapid population declines, which began in the mid-1990s. They are listed by IUCN as Critically Endangered, the highest level of endangerment short of extinction in the wild. The oriental white-backed vulture population in India in 2007 was estimated at one-thousandth of its level in the early 1990s. Veterinary use of the non-steroidal anti-inflammatory drug (NSAID) diclofenac is the major cause of these declines. Diclofenac has been used to treat symptoms of disease and injury in domesticated ungulates in many parts of the Indian subcontinent since the 1990s. The effects of diclofenac have been studied experimentally on captive individuals of three of the global total of eight *Gyps* vulture species. In all of the species tested, death occurred within a few days of treatment with a single dose of diclofenac and severe kidney damage and extensive visceral gout (accumulation of the excretory product uric acid) were observed post mortem. The kidneys of vultures that died in these experiments showed similar pathology to that found in the majority of vulture carcasses collected from the wild since the declines began. A large-scale survey of the amount of diclofenac in liver tissue from carcasses of domesticated ungulates available as food to vultures in India in 2004 – 2005 showed that the prevalence and concentration of the drug at that time was more than sufficient to cause the observed rapid population declines which were occurring then.

There are important differences between Southeast Asia and the Indian subcontinent in the problems faced by vulture populations. Cambodia still supports small but stable remnant populations of oriental white-backed vulture, slender-billed vulture and red-headed vulture (*Sarcogyps calvus*) numbering hundreds of individuals in total. Diclofenac appears not to be widely used for veterinary purposes in the Southeast Asian countries where surveys have been conducted, including Cambodia and Myanmar. Most recorded vulture deaths in Cambodia are attributed to accidental poisoning. Hunters use poisoned bait to catch and kill quarry species such as waterbirds and poisoned bait is also used to kill problem dogs or cattle. Cambodia's vultures are also thought to be chronically food limited. Populations of wild ungulates on whose carcasses they previously relied upon have undergone severe declines. The free-ranging herds of domestic bovids that replaced them are now also declining, as a result of mechanisation of agriculture. Infrastructure development and illegal logging are increasingly bringing people into remote areas where vultures remain.

Conservation Responses

Soon after research had indicated the severity of the effects of diclofenac on vulture populations, the governments of India, Pakistan and Nepal commenced actions to prevent the contamination of vulture food supplies with the drug. India's National Board for Wildlife recommended a ban on veterinary use on 17 March 2005. In May 2006, a directive from the Drug Controller General of India was circulated to relevant officials, requiring the withdrawal of manufacturing licences for veterinary formulations of diclofenac. This directive was further strengthened in 2008, when it was made an imprisonable offence to manufacture, retail or use diclofenac for veterinary

purposes. Similar measures were introduced in Pakistan and Nepal at about the same time. Veterinary use of diclofenac was banned in Bangladesh in 2010.

Action to prevent the extinction of *Gyps* vultures in South Asia is co-ordinated by Saving Asia's Vultures from Extinction (SAVE), a consortium of eleven organisations with established expertise in vulture conservation, which was established in 2011. The national and state governments of the four vulture range states in the Indian subcontinent are engaged in conservation measures through national action plans, and are linking their activities through the Regional Steering Committee for Vulture Conservation (RSC), set up to implement the recommendations of the inter-governmental Declaration on Vulture Conservation within the region in May 2012. For more details of the composition and function of SAVE see Appendix I.

Conservation actions undertaken so far, in addition to the restrictions on diclofenac use, include surveys to measure the effectiveness of the ban on veterinary diclofenac, regular surveys of vultures to measure their population trends, awareness raising to make the ban more effective, advocacy for enforcement of the ban, contact with the pharmaceutical industry, testing to establish which veterinary drugs are safe and which are harmful to vultures, the creation of Vulture Safe Zones in which intensive campaigns are undertaken to remove toxic NSAIDs from the food supply of the remaining small populations of wild vultures, and conservation breeding to provide a secure captive population and a surplus of captive-bred birds for reintroductions.

Vulture conservation measures in Cambodia differ from those employed in the Indian subcontinent because the threats are different, especially in the absence of a significant threat from diclofenac. Conservation actions taken so far include monthly supplementary feeding at up to seven

sites in the north and east of the country, nest protection and advocacy against inappropriate use of agricultural chemicals as poisons.

There is Hope for South Asia's Vultures

These conservation actions have achieved substantial success and have resulted in the following major achievements.

1. All vulture range states in the Indian subcontinent have banned the veterinary use of diclofenac.
2. Regular monitoring of NSAID residues in cattle carcasses shows that the level of diclofenac contamination of the vulture food supply has fallen substantially.
3. Safety testing identified a safe alternative drug, meloxicam, and monitoring of NSAID residues in cattle carcasses shows that its use has increased markedly in India. Veterinary meloxicam has become widely available in Nepal and Bangladesh.
4. Vulture Safe Zones, which were pioneered in Nepal, are being introduced in other states, expanded, tested and developed.
5. Population monitoring in Cambodia indicates that the small populations of vultures there are approximately stable.
6. Captive populations of all three of the endangered *Gyps* species have been established. The captive birds are surviving well and juveniles of all species have been bred in captivity.
7. In India, regular monitoring of vultures using the repeatable survey method of road transect counts shows that vulture declines have slowed or ceased. Evidence from vulture monitoring in Nepal,

Pakistan and Bangladesh also indicates that the population declines there have slowed or reversed.

What remains to be done?

These are all hopeful signs, but the following serious concerns remain.

1. Vulture populations are precariously small and will remain vulnerable to adverse events until numbers have increased substantially. This vulnerable period will be lengthy because the low natural reproductive capacity and long duration of immaturity of vultures means that, even under the most favourable conditions, the shortest period in which a wild vulture population can double in size is about ten years. The rate of the recent population decline was much more rapid than the most rapid possible rate of increase, with the population of the species most strongly affected by diclofenac halving every year in India and Pakistan. Even when diclofenac has disappeared, conditions may not permit the maximum possible rate of recovery because of other problems caused by the vulture decline (see points 2 and 3 below) and effects of other NSAIDs (see points 5 - 7 below).
2. In the Indian subcontinent, the disappearance of vultures has led to cattle carcasses being disposed of in ways, such as burial, that may restrict the availability of carrion as food for a recovering vulture population in the future. In Southeast Asia, low populations of wild and domesticated ungulates continue to limit the small vulture populations there.
3. Increases in populations of feral dogs and other predators, caused by enhancement of their carrion food supply in the absence of vultures, may be increasing the frequency of predation of livestock and, as a

response, the deliberate placement of poison baits in carcasses to kill the predators. This in turn leads to unintended poisoning of vultures. Large populations of feral dogs and other species of scavengers give rise to other problems, such as an increased risk of dog bites and rabies in humans and other types of disease and public nuisance. Dealing with these problems imposes substantial extra costs on government agencies and charities.

4. Contamination of cattle carcasses with diclofenac has declined, but it has not been eliminated yet. Diclofenac intended for human use is easy to obtain, and easy to misuse for the treatment of livestock because pharmaceutical companies market the drug in larger vials than are required for human medicine. Consequently, carcasses of wild vultures continue to be found with traces of diclofenac in their tissues and post-mortem findings continue to indicate that diclofenac poisoning was the cause of death.
5. The veterinary use of another NSAID (ketoprofen) known to be toxic to *Gyps* vultures is legal and has increased. Other NSAIDs are also in legal use which may be harmful to vultures, but have not yet been tested.
6. Aceclofenac, an NSAID that is likely to be metabolised into diclofenac after being administered to cattle, is beginning to be used. It is likely to kill vultures that feed on contaminated carcasses.
7. There is no co-ordinated, well-established and efficient regulatory mechanism by which legal restrictions are imposed upon veterinary drugs known to cause harm to vultures or on those whose effects have not yet been studied.
8. In some areas, the sparse remaining populations of vultures are threatened by loss or disturbance of nest sites through tree-felling or development.

The Need for a Blueprint for Vulture Recovery

At the moment, encouraging signs of success in the recovery of South Asia's Critically Endangered vultures are mixed with evidence of the continuation of impacts of partially-solved problems and the emergence of new ones. Hence, it is time to establish a more robust long-term vision for the recovery and future safeguarding of South Asia's vulture populations. The ultimate objective is to recover the populations of all of the *Gyps* vulture species to levels where they are secure against future threats and are providing services and functions in both natural and artificial ecosystems. This will not necessarily involve a full recovery to the high population levels of the early 1990s. The future carrying capacity for vultures of the Indian subcontinent may be lower than it was. Because of the lack of vultures, methods for the disposal of cattle carcasses are changing and this is likely to reduce the vultures' food supply. Lack of food is also a problem in Southeast Asian range states such as Cambodia, where carcasses of both domesticated and wild ungulates are scarce and probably limiting the vulture population. In future, it should at least be the case that there are healthy vulture populations sufficient to consume the remains of the large numbers of carcasses of wild ungulates killed annually by predators, diseases and floods in National Parks and other natural and semi-natural areas. Currently, vultures are scarce or absent even in these areas, which demonstrates that protection of natural ecosystems alone is insufficient for the effective conservation of vulture populations. Parks are too small to achieve this on their own. Satellite tagging has shown that vultures range over huge areas in search of carrion and so the presence of diclofenac-contaminated cattle carcasses around the margins of even the largest of the National Parks has been sufficient to eliminate or greatly reduce their vultures.

What is required now to achieve the objective of large and self-sustaining populations of wild vultures is a long-term programme, which links together all the necessary strands of regulatory and conservation action with scientific research and monitoring. This programme is outlined in the following tables, which present Action Timelines for each strand of activity. The timelines cover the period up to 2025. The vulture range states with the largest remaining populations are already covered by the Action Timelines and it is hoped that the inclusion timelines for other states such as Myanmar, Laos and Bhutan may become possible in future. The programme moves through phases of completing the removal of diclofenac from vulture food supplies in areas with remaining vulture concentrations, to achieving this throughout the vulture range states, preventing similar hazards from other drugs arising in future and countering other emerging threats. In this period, the conservation breeding elements of the programme will move from establishing a self-sustaining captive population of vultures to providing birds for reintroduction and supplementation of remaining wild populations and then, on to maintaining a population in captivity in the longer term as insurance against new threats. Even if conditions for vultures in the wild become favourable again, their low maximum reproductive rate means that they will be slow to recolonise areas where they are now missing. Hence, reintroduction into areas where vultures are absent is likely to be an important tool in restoring their distribution.

SAVE is proposing this blueprint in the first instance, but it is hoped that it will be added to and implemented jointly as a partnership between conservation organisations, government agencies and the pharmaceutical industry.

The Action Timelines

Action timelines are organized by type, except for Cambodia where all actions are presented together. **Red-type** shows 2017 updates/additions.

Action Timelines for advocacy, awareness raising and regulation at the national level (AD). Part 1.

Timeline code	Activity	Responsible Agencies	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
AD1	Achieve the removal from the market of vials of diclofenac supposedly intended for human medicine in excess of 3 ml capacity.	BNVRC BFD IUCNBang'desh WWFPakistan NVRC BCN NTNC BNHS SAVE Associates	Propose restrictions on large vials to the Regional Steering Committee, National Vulture Recovery Committees (NVRCs), governments and pharmaceutical industry. Establish the restrictions. 2016 Pakistan/Bangladesh: make contact and take steps to prevent licensing through drug authorities. Nepal: seek ban Cambodia (to consider/ refer back)			Proactive involvement (including providing technical assistance) in court case brought by Indian pharma company to uphold 2015 ban (India) Monitor availability of larger (<3ml) diclofenac vials (All)								
AD2	Achieve the banning of the veterinary use of ketoprofen and aceclofenac in India, Pakistan, Bangladesh and Nepal.	BNVRC BFD IUCNBang'desh WWF Pakistan NVRC BCN NTNC BNHS SAVE Associates	Discuss the issue with the Regional Steering Committee, governments and pharmaceutical industry using research results.	2016: Bangladesh/Nepal/Pakistan/India: Seek ban – follow-up on process already initiated. Bangladesh only: Enforce ban within VSZ as first step India/Nepal: Approach State Drug Controller/Animal Husbandry Director to stop Govt. supplies to vets and prohibits use by Govt vets. (refer to 2012 Delhi Declaration) – at least all VSZ initiatives to do this Provide technical assistance and advice on the operation of the ban, using information from monitoring. (Bangladesh/Nepal/Pakistan/India) SAVE to make/update materials available on website specific to these NSAIDSs 2017: Formally approach Drug Controller Gen (India) through IVRI Request IVRI to provide technical input for joint recommendation with BNHS to prompt an advisory from DCGI on this as interim measure Approach Pakistan drug authorities requesting ban (even though not in use) Hold meetings with Bangladesh DC tech committee to reinforce & extend ketoprofen ban to national level (Bangladesh) Contact all state/provincial Anim hus to stop supply Govt vets with these drugs										
AD3	Establish a procedure in India and Nepal through which identification by testing of a drug hazardous to vultures at or below maximum likely exposure levels leads to a ban on its use for veterinary purposes.	SAVE TAC BNVRC BFD IUCNBang'desh WWF Pakistan NVRC BCN	Initiate discussions with the Regional Steering Committee, governments and pharmaceutical industry. Establish a procedure.	2016: SAVE writes protocol and make available on SAVE website Provide technical assistance and advice on the operation of the procedure, using information from monitoring. Engage with the pharmaceutical industry to do this.2017: Explore the possibility of a moratorium on new (veterinary) NSAIDS										

		NTNC BNHS														
Action Timelines for advocacy, awareness raising and regulation at the national level (AD). Part 2.																
Timeline code	Activity	Responsible Agencies	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025		
AD4	Establish procedures by which veterinary drugs with unknown effects on vultures have their approval for veterinary use withheld or withdrawn until scientific testing on <i>Gyps</i> vultures establishes their safety at maximum likely exposure levels.	BNVRC BFD IUCNBang'desh WWF Pakistan NVRC BCN NTNC BNHS SAVE Associates	Initiate discussions with Regional Steering Committee, National Vult Recov. Committees (NVRCs), govts and pharmaceutical industry. Establish procedures.		SAVE (all partners coordinated by TAC) writes protocol and make this available on SAVE website (for comment). Provide technical assistance and advice on the operation of the procedures, using information from monitoring. Engage with the pharmaceutical industry to do this. Discuss with NVRCs and at Regional Steering Committee (RSC)											
AD5	Work with both the pharmaceutical industry and governments to identify, by a robust safety testing and approval process, NSAIDs that are safe for vultures. Currently meloxicam is the only such drug.	IVRI BNHS	Provide encouragement and technical advice.		Promote funding of IVRI safety testing and discuss revision of the list of drugs to be tested. Provide encouragement and technical advice.											
AD6	Contribute, with government agencies and pharmaceutical companies, to maintaining pharmacovigilance and regulation of veterinary drugs, to prevent their negative effects on wild vultures.	NVRCs BNVRC, BFD IUCNBang'desh WWF Pakistan BCN, NTNC BNHS			Initiate discussions with Regional Steering Committee, national committees governments and pharmaceutical industry. Establish procedures.											

AD7	Establish a SAVE alert system for veterinary drugs which combines information of levels of use from pharmacy surveys and analyses of cattle carcasses with results from safety testing to draw attention of govts to potentially hazardous drugs.	SAVE TAC All SAVE Partners	Operate system and provide advice to the Regional Steering Committee, governments and pharmaceutical industry	Establish system within SAVE. Operate system and provide advice to the Regional Steering Committee, governments and pharmaceutical industry. Add SAVE website feature on this (include updates on pharmacy surveys) All partners to alert SAVE of any changes & post on website
AD8	Improve the availability of more effective meloxicam formulations thereby facilitating take up by veterinary practitioners	BNVRC DGDA DLS IUCN		Contact and sensitisation of pharma industry (approach major companies for support). Sensitise drug regulation authorities in each country to take appropriate steps to favour production of well formulated veterinary meloxicam.
AD9 (action added Nov 2016)	Develop wider awareness-raising initiatives to highlight NSAIDs concerns and provide incentives or acknowledgement of those taking positive steps.	SAVE Associates BNVRC All to consider		2017: Initiate system to support eg cattle shelters & dairy cooperatives that ensure only vulture-safe NSAIDs are used. (eg kite-mark/certification system) (India, Bangladesh)

Action Timelines for conservation breeding (CB). Part 1.

Timeline code	Activity	Responsible Agencies	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
CB1	Conservation breeding of OWBV, LBV and SBV at VCBC Pinjore (India).	BNHS Haryana FD CZA	Maintain the captive population in good health. Produce as many fledglings as possible of all three species, using artificial intervention as appropriate.				Maintain the captive population in good health. Produce as many fledglings as possible of all three species, using artificial intervention as appropriate, but with less emphasis on OWBV and more on SBV and LBV, using artificial intervention for those species if appropriate. Transfer of surplus immatures to release programme.					Maintain the captive population in good health. Produce sufficient fledglings to replace adult losses.		
CB2	Conservation breeding of OWBV, LBV and SBV at VCBC Rajabhatkhawa (India).	BNHS W Bengal FD CZA	Maintain the captive population in good health. Produce as many fledglings as possible of all three species, but with special emphasis on SBV, using artificial intervention for that species if appropriate.				Maintain the captive population in good health. Produce as many fledglings as possible of all three species, but with special emphasis on SBV, using artificial intervention for that species if appropriate. Transfer of surplus immatures to release programme.					Maintain the captive population in good health. Produce sufficient fledglings to replace adult losses.		
CB3	Conservation breeding of OWBV and SBV at VCBC Rani (India).	BNHS Assam FD CZA	Maintain the captive population in good health. Produce as many fledglings as possible of both species, but with special emphasis on SBV, using artificial intervention for that species if appropriate.				Maintain the captive population in good health. Produce as many fledglings as possible of both species, but with special emphasis on SBV, using artificial intervention for that species if appropriate. Transfer of surplus immatures to release programme.					Maintain the captive population in good health. Produce sufficient fledglings to replace adult losses.		
CB4	Conservation breeding of OWBV at VCC Changa Manga (Pakistan).	WWF Pak Punjab Prov Govt.	Maintain the captive population in good health. Produce as many fledglings as possible by natural methods and artificial incubation as necessary. Transfer of birds to release programme as appropriate.									Maintain the captive population in good health. Produce sufficient fledglings to replace adult losses.		

Action Timelines for conservation breeding (CB). Part 2.

Timeline code	Activity	Responsible Agencies	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
CB5	Conservation breeding of OWBV at VCBC Chitwan (Nepal).	BCN NTNC DFNWC	Maintain the captive population in good health. Produce as many fledglings as possible by natural methods.		Maintain the captive population in good health. Produce as many fledglings as possible by natural methods. Transfer some wild-bred birds to release facility.		Maintain the captive population in good health. Produce as many fledglings as possible by natural methods. Transfer captive-bred immatures to release facility.					Maintain the captive population in good health. Produce sufficient fledglings to replace adult losses.		
CB6	Conservation breeding of OWBV and LBV at CZA centres (India).	CZA Zoos	Training of staff and preparation of facilities	Transfer of captive-bred OWBV and LBV from VCBC Pinjore.	Maintain the captive population in good health. Produce as many fledglings as possible by natural methods.				Maintain the captive population in good health. Produce as many fledglings as possible by natural methods. Transfer captive-bred birds to release facility or other centres.			Maintain the captive population in good health. Produce sufficient fledglings to replace adult losses.		
CB7	Conservation breeding of OWBV in Bangladesh.	BNVRC BFD Zoos Safari Parks	Consider the development of a VCBC in Bangladesh.											
CB8 (action added Nov. 2014)	Conservation breeding of OWBV & LBV at VCBC Bhopal (India)	BNHS Madhya Pradesh FD CZA	Establish & maintain a captive population in good health – primarily through supply and exchanges of subadult birds from other existing centres.			Maintain the captive population in good health. Produce as many fledglings as possible of both species, initially through natural breeding but subsequently using artificial intervention as appropriate.. Transfer of surplus immatures to release programme and fully integrate the management of this population with the wider release plans and any exchanges required to optimize genetic and sex-ratio aspects of the Indian captive populations of these species as a whole.					Maintain the captive population in good health. Continue to supply birds for release programme. Produce sufficient fledglings to replace adult losses.			

Action Timelines for Vulture Safe Zone implementation (VS). Part 1.

Timeline code	Activity	Responsible Agencies	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
VS1	Identification and selection of new provisional Vulture Safe Zones (pVSZs) in India, in particular for LBV.	BNHS	Collect information and select pVSZs.	Done										
VS2	Capacity building and local advocacy of provisional Vulture Safe Zones (pVSZs) in India.	BNHS	Develop capacity in pVSZs. (ongoing)											
VS3	Selection of pVSZs in India suitable for conversion to full VSZs.	BNHS				Selection and conversion (2017 ongoing) of pVSZs to full VSZs based upon undercover pharmacy monitoring of fates of tagged vultures. Focus on proposed release areas & transboundary areas VSZs emphasis (prioritise Haryana, UP, Bihar, Gujarat, Tripura, Meghalaya, W Bengal, Jharkhand,2017: Review selection/process & then again review in 2019, 2021.								
VS4	Maintenance and review of VSZs in India	BNHS SAVE Associates	Continue VSZ implementation. Potential removal of VSZ status if monitoring shows that conditions have changed.											
VS5	Release of captive-bred vultures in VSZs in India.	BNHS Indian State Govts		Transfers of captive-bred vultures to holding aviaries in VSZs.	2016: Releases of first captive-bred vultures in VSZs.	Continued releases of captive-bred vultures in VSZs.								
VS6	Maintenance and review of VSZs in Nepal.	NNVRC BCN	Continue VSZ implementation and expansion											
VS7	Release of wild-taken and captive-bred vultures in VSZs in Nepal.	NNVRC BCN NTNC				Releases of wild-taken OWBV not likely to breed from Chitwan VCBC.			Releases of captive-bred OWBVs.					
VS8	Identification and selection of additional pVSZs in Pakistan.	WWF Pak	Identify and select pVSZs.	Develop capacity										
VS9	Maintenance and review of VSZs in Pakistan.	WWF Pak	Continue VSZ implementation and expansion.											
VS10	Release of captive-bred vultures in VSZs in Pakistan	WWF Pak							Releases of captive-bred vultures in VSZs					

Action Timelines for Vulture Safe Zone implementation (VS). Part 2.

Timeline code	Activity	Responsible Agencies	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
VS11	Livestock management and husbandry training in pVSZs and VSZs in Pakistan	WWF Pak	Develop and implement training programme.											
VS12	Free veterinary camps in pVSZs and VSZs in Pakistan.	WWF Pak	Develop and implement programme.											
VS13	Community-led vulture-based tourism in pVSZs and VSZs in Nepal (and in Pakistan local tourists only).	BCN WWF Pak SAVE Associates	Develop and implement programme (after ensuring viability, and ensuring no disturbance).											
VS14.	Identification and selection of pVSZs and VSZs in Bangladesh.	BNVRC BFD IUCN Bng	Identify and select pVSZs.	Done										
VS15.	Implementation of pVSZs in Bangladesh.	BNVRC BFD IUCN Bng	Implement VSZ programme.											

Action Timelines for Vulture Safe Zone monitoring (ZM).

Timeline code	Activity	Responsible Agencies	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
ZM1	Monitoring of survival and causes of death of wild vultures with GPS PTTs in pVSZs and VSZs	BNVRC BFD IUCN Bng BNHS IVRI BCN WWF Pak	Seek permits for capture and tagging of wild vultures in VSZs.		Capture and tag samples of wild vultures with GPS tags. Monitor to identify foraging sites, recover corpses and establish cause of death. Seek permits for OWBV capture and tagging of wild vultures in VSZs. (done for RHV) (Nepal/Bangladesh/Pakistan/India) 2017: Initial tagging trials & monitoring/recovery system in place for any mortalities for autopsy									
ZM2	Monitoring of survival and causes of death of released vultures with GPS PTTs in pVSZs and VSZs.	BNVRC BFD IUCN Bng BNHS IVRI BCN WWF Pak			Seek tagging permissions 2017: Tag all captive-bred vultures prior to release with GPS tags. Monitor to identify foraging sites, recover corpses and establish cause of death.									
ZM3	Monitoring of survival and causes of death of wild and released vultures with GPS PTTs in pVSZs and VSZs in Pakistan.	WWF Pak					Capture and tag wild vultures in VSZs. Tag released captive-bred vultures. Monitor to identify foraging sites, recover corpses and establish cause of death.							
ZM4	Monitoring of availability of NSAIDs for veterinary use in representative samples of pharmacies and other outlets in pVSZs and VSZs in India, Pakistan, Bangladesh and Nepal	BNVRC BFD IUCN Bng BNHS IVRI BCN WWF Pak	Conduct undercover surveys of outlets for veterinary drugs. Record NSAIDs offered for use for veterinary purposes. Identify the provenance and vial size of diclofenac offered illegally for veterinary use.											
ZM5	Monitoring of wild vulture populations and breeding success in pVSZs and VSZs in India, Pakistan, Bangladesh and Nepal.	BNVRC BFD IUCN Bng BNHS IVRI BCN WWF Pak	Conduct surveys over representative areas of the zone, including nest counts and/or road transect surveys, as appropriate											

Action Timelines for research and monitoring at the national level (RM). Part 1.

Timeline code	Activity	Responsible Agencies	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
RM1	Develop method for GPS PTT vulture tracking and corpse recovery in VSZs.	RSPB BNHS BCN	Complete tagging and recovery tests on RHV and LBV. Evaluate corpse recovery using simulated tagged corpses. Test tag attachment methods on captive <i>Gyps</i> vultures.			Begin tag deployment on <i>Gyps</i> vultures in pVSZs and VSZs.								
RM2	Road transect surveys of vulture numbers in India.	BNHS RSPB		Conduct surveys using same methods as in previous surveys.	Publish results of the survey done in the previous year.		Conduct surveys using same methods as in previous surveys.	Publish results of the survey done in the previous year.		Conduct surveys using same methods as in previous surveys.		Conduct surveys using same methods as in previous surveys.	Publish results of the survey done in the previous year.	
RM3	Road transect surveys of vulture numbers in Nepal.	BCN RSPB	Conduct survey using same methods as in previous surveys. Western lowland surveys annually. Midhills and East-West highway survey every four years.											
RM4	Vulture population monitoring in Pakistan and Bangladesh.	WWF Pak BNVRC IUCN Bng BFD	Continue to develop and conduct repeatable population surveys. 2016: Bangladesh: Ongoing annual surveys 2017: Pakistan: National survey											
RM5	Monitoring of NSAID contamination of ungulate carcasses in northern India and Nepal.	BNHS IVRI BCN	Complete current round of sample collection in several states. Measure concentrations of all NSAIDs potentially hazardous to vultures	Publish NSAID monitoring results and expected effects on vulture death rates	2016: Collect samples in several states according to previous protocol. (not India) Measure concentrations of all NSAIDs thought to be potentially hazardous to vultures 2017: India	Publish NSAID monitoring results and expected effects on vulture death rates	Collect samples in several states according to previous protocol. Measure concentrations of all NSAIDs thought to be potentially hazardous to vultures	Publish NSAID monitoring results and expected effects on vulture death rates	Collect samples in several states according to previous protocol. Measure concentrations of all NSAIDs thought to be potentially hazardous to vultures	Publish NSAID monitoring results and expected effects on vulture death rates				

	Action Timelines for research and monitoring at the national level (RM). Part 2.													
Timeline code	Activity	Responsible Agencies	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
RM6 (B'desh added Nov. 2014)	Monitoring of causes of death and NSAID contamination of wild vultures in India, Pakistan, Nepal and Bangladesh.	BNVRC BFD Universities	Collect as many dead wild and released vultures as possible. Conduct post mortem examinations to determine causes of death. Take liver and kidney samples and determine concentrations of all NSAIDs known to be in veterinary use. Trial methods to detect NSAIDs in bone and other hard tissues. Retain carcasses frozen for future use. Publish the results periodically.											
RM7	Safety testing on captive vultures at Pinjore of NSAIDs of uncertain toxicity.		Obtain wild Himalayan griffon vultures and house in captivity for safety testing programme.	Conduct testing of four NSAIDs. Apply to test four more NSAIDs.	Conduct testing of four NSAIDs. Review safety testing programme and decide on testing needs.	Continue testing programme as NSAIDs posing potential hazards are identified by the SAVE alert system (see timeline AD6).								
RM8	Monitoring of availability of NSAIDs for veterinary use in pharmacies and other outlets in India, other than in VSZs. Equivalent surveys in Nepal are mainly in VSZs and covered by ZM4.		Complete current round of undercover and open pharmacy surveys linked with sampling of ungulate carcasses (see timeline RM4).	Publish NSAID availability monitoring results.	Conduct undercover and open pharmacy surveys linked with sampling of ungulate carcasses (see timeline RM4).	Publish NSAID availability monitoring results.	Conduct undercover and open pharmacy surveys linked with sampling of ungulate carcasses (see timeline RM4).	Publish NSAID availability monitoring results.	Conduct undercover and open pharmacy surveys linked with sampling of ungulate carcasses (see timeline RM4).	Publish NSAID availability monitoring results.				
RM9	Monitoring of availability of NSAIDs for veterinary use in pharmacies and other outlets in Pakistan.		Conduct undercover surveys of outlets for veterinary drugs. Record NSAIDs offered for use for veterinary purposes. Identify the provenance and vial size of diclofenac offered illegally for veterinary use.											

Action Timelines for research and monitoring at the national level (RM). Part 3.														
Timeline code	Activity	Responsible Agencies	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
RM10	Estimation of the former and potential future value of the ecosystem services provided by wild vultures.		Conduct a survey of costs of cattle carcass disposal, feral dog control and other ecosystem service measurements.											
RM11	Investigate factors affecting use of vulture-safe NSAIDs by veterinarians, paravets and livestock owners.		Conduct questionnaire studies, choice experiments and other investigations, as appropriate.											

Action Timelines for Cambodia (CAM).

Timeline code	Activity	Responsible Agencies	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
CAM1 (minor rewording Nov. 2014)	Monthly supplementary feeding in at least six sites		Provide at least one dead cow per month at vulture restaurants											
CAM2	Improve population monitoring		Census vulture restaurants in March, June, September and December											
CAM3	Safeguard nesting areas from logging		Check all known nest locations, improve law enforcement at key sites	Law enforcement to prevent logging at key sites										
CAM4	Protect vulture nests from human predation		Evaluate effectiveness of nest protection across sites	Continue nest protection if found to be effective	Continue nest protection if found to be effective	Evaluate effectiveness of nest protection across sites	Continue nest protection if found to be effective	Continue nest protection if found to be effective	Evaluate effectiveness of nest protection across sites	Continue nest protection if found to be effective	Continue nest protection if found to be effective	Evaluate effectiveness of nest protection across sites	Continue nest protection if found to be effective	Continue nest protection if found to be effective
CAM5	Monitor sales of veterinary drugs at key sites		Quarterly monitoring of veterinary drug sales at key sites											
CAM6	Increase sustainability of CVCP		Integrate vulture conservation activities into other NGO activities	Develop sustainable financing where possible	Evaluate CVCP activities and effectiveness	Develop sustainable financing where possible	Nationalize management of CVCP							