Government of India

Guidelines for Mitigating Human–Wild Pig Conflict

Taking a Harmonious-Coexistence Approach

Ministry of Environment, Forest and Climate Change, Government of India, 2023

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Abbreviations

BMZ	German Federal Ministry for Economic Cooperation and Development
CWLW	Chief Wildlife Warden
CZA	Central Zoo Authority
DBT	Direct Benefit Transfer
DFO	Divisional Forest Officer
DLCC	District-level Coordination Committee
DNA	Deoxyribonucleic acid
EIA	Environmental impact assessment
EWRR	Early Warning and Rapid Response
GIS	Geographical information system
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GoI	Government of India
HOFF	Head of Forest Force (in a state)
HWC	Human–wildlife conflict
HWC-MAP	Human–Wildlife Conflict Management Action Plan
HWC-NAP	National Human–Wildlife Conflict Mitigation Strategy and Action Plan
HWPC	Human-Wild Pig Conflict
HWC-SAP	State-level HWC Mitigation Strategy and Action Plan
IFS	Indian Forest Service
IUCN	International Union for Conservation of Nature
JFM	Joint Forest Management
MoEF&CC	Ministry of Environment, Forest and Climate Change, Government of India
NDRF	National Disaster Response Force
NGO	Non-governmental organization
NTCA	National Tiger Conservation Authority
NTG	National Technical Group
NWAP	National Wildlife Action Plan
OPs	Operating procedures
PA	Protected area
PCCF	Principal Chief Conservator of Forest
PPE	Personal protective equipment
PRT	Primary Response Team
RFID	Radio frequency identification
RRT	Rapid Response Team
SDRF	State Disaster Response Force
SFD	State forest department
SHG	Self-help group
SLCC	State-level Coordination Committee
SOPs	Standard operating procedures
WII	Wildlife Institute of India
WLPA	Wild Life (Protection) Act, 1972

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1 ABOUT THE GUIDELINES

1.1 THE OVERALL CONTEXT

- These guidelines get their overall context from the Wild Life (Protection) Act, 1972 (WPA), the Advisory to Deal with Human–Wildlife Conflicts (HWC) (F. No. 8-60/2020 WL (Part-1)) (MoEF&CC 2021) and the National Human–Wildlife Conflict Mitigation Strategy, National Wildlife Action Plan (2017-35)[1] and National Human-Wildlife Conflict Mitigation Strategy and Action Plan of India (2021–26) (HWC-NAP)[2]. The HWC-NAP provides the overall conceptual and institutional framework for implementing these guidelines.
- These guidelines take into consideration the existing guidelines, advisories and good practices on human–Wild Pig conflict (HWPC) mitigation issued by the Ministry of Environment, Forest and Climate Change (MoEF&CC) and advisories and standard operating procedures (SOPs) issued by various state forest departments (SFDs) and builds on them to bring about a more holistic approach to HWPC mitigation.
- The following guidelines on cross-cutting issues are to provide guidance on selected issues: Guidelines for Cooperation between the Forest and Media sector in India: Towards effective communication on Human-Wildlife Conflict Mitigation; Occupational Health and Safety in the Context of Human–Wildlife Conflict Mitigation; Crowd Management in Human-Wildlife Conflict Related Situations; and Addressing Health Emergencies and Potential Health Risks Arising Out of Human—Wildlife Conflict Situations: Taking a One Health Approach..
- In addition to the HWPC mitigation guidelines, following guidelines are to provide guidance on other selected species: guidelines for mitigating human–Elephant, –Leopard, –Gaur, –Snake, –Crocodile, –Macaque, –Blue Bull, –Bear and –Blackbuck conflicts.

1.2. PURPOSE AND SCOPE

- The guidelines aim to facilitate a common understanding among key stakeholders on what constitutes effective and efficient mitigation of HWPC in India, leading to co-existence, and to ensure standardisation in performing mitigation operations in the most effective and efficient manner, with minimum damage to humans and Wild Pigs.
- The guidelines provide advice on mitigation measures to be used to address HWPC in the long term, as well as to facilitate the development, assessment, customisation and evaluation of site-specific HWPC mitigation measures that are effective and wildlife-friendly.
- The guidelines serve as a basis for overall long-term planning and coordination of HWPC mitigation measures at the national, state and division levels.
- In general, the guidelines apply to all stakeholders relevant to HWPC mitigation and are not limited to state forest departments (SFDs).
- The guidelines will be able to bring in more effectiveness and efficiency when they are fully integrated into the division-level HWC Management Action Plans (HWC-MAP) and state-level HWC Mitigation Strategy and Action Plans (HWC-SAP).

1.3 APPROACH

- The development and implementation of these guidelines is driven by a harmonious-coexistence approach[3] to ensure that both humans and Wild Pigs are protected from negative impacts of HWPC.
- The guidelines address the issue of HWPC, taking a holistic approach. The holistic approach of the guidelines entails not only addressing the emergency situations arising due to immediate conflict situations but also addressing the drivers and pressures that lead to HWPC; providing guidance on establishing and managing prevention methods; and reducing the impact of conflict on both humans and Wild Pigs.
- The development of these guidelines and their intended implementation are driven by a participatory approach. These guidelines are intended to facilitate participatory planning, development and implementation of HWPC mitigation measures with key sectors and stakeholders at the national, state and local levels.
- Efforts have been made to forge linkages with plans and guidelines of key relevant sectors for enhancing synergies and eliminating trade-offs at the field level.
- Taking a capacity development approach, the guidelines facilitate the implementers through provision of *Implementer's Toolkit*, which includes Operating Procedures (OPs), formats, checklists, and other field implementation aids.

1.4 LEGAL AND POLICY FRAMEWORK FOR IMPLEMENTING THE GUIDELINES

- These guidelines should be read in conjunction with the existing relevant legal and regulatory frameworks, especially the Wildlife (Protection) Act, 1972. The following legislations are considered directly relevant for conservation when dealing with HWPC:
  - Wildlife (Protection) Act, 1972
  - Prevention of Cruelty to Animals Act, 1960
- Sections 9, 11(1)(a) (2) (3), 12(bb), 29, 35(6) and 39(1)(a) of the WLPA 1972 are especially relevant when dealing with HWPC.
- Other important laws that facilitate conservation when dealing with HWPC include the Environment Protection Act, 1986; Indian Penal Code, 1860; Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006; the Indian Forest Act, 1927; the Forest (Conservation) Act, 1980; the Environment (Protection) Act, 1986; and Disaster Management Act, 2005.
- The Supplementary Framework to HWC-NAP on Legislative Framework for HWC Mitigation in India[4] may be referred to for more details on the specific legal provisions for HWC mitigation.

1.5 INSTITUTIONAL FRAMEWORK FOR IMPLEMENTING THE GUIDELINES

- The institutional mechanism outlined in the HWC-NAP will be followed for implementing these guidelines.

1 MoEFCC (2017). National Wildlife Action Plan (2017-35)

2 National HWC Mitigation Strategy and Action Plan of India (2021-26), available from https://moef.gov.in/wp-content/uploads/2022/01/National-Human-Wildlife-Conflict-Mitigation-Strategy-and-Action-Plan-of-India-2.pdf

3 'Harmonious coexistence' is defined as a dynamic but sustainable state in which humans and wildlife adapt to living in shared landscapes, with minimum negative impacts of human-wildlife interactions on humans or on their resources and on wildlife or habitats. The mitigation measures designed using this approach maintain a balance between the welfare of animals and humans in which the two are given equal importance. The overlap in space and resource use is managed in a manner that minimises conflict.

4 Supplementary frameworks to the HWC-NAP: https://moef.gov.in/wp-content/uploads/2022/01/National-Human-Wildlife-Conflict-Mitigation-Strategy-and-Action-Plan-of-India-2.pdf

2. CONTEXT AND SITUATION

The Wild Pig (*Sus scrofa*) is a classical example of a multi-speciality ecosystem engineer. It ploughs, disperses seeds, forms an important prey base for large carnivores and plays an important role as a scavenger. No other species has this combination of specialisations. The presence of the Wild Pig is an indication of the true functional value of an ecosystem. The high rate of reproduction and widespread distribution of the Wild Pig helps maintain these functions in the different types of ecosystem that it is found in.

The Wild Pig is one of the most abundant and widely distributed large-sized omnivorous ungulates. The Wild Pig is categorised as a Least Concern species by the IUCN Red List. In India, it is distributed everywhere except in the upper Himalaya and in the desert areas of Gujarat and Rajasthan. Since the Wild Pig populations in most states within India have not been enumerated or estimated regularly, there is very little information about the population or status of the species.

Human-Wild Pig conflict (HWPC) refers to the negative interaction between humans and Wild Pigs, leading to adverse impacts, such as injuries to humans, loss of human lives, crops, livestock and other properties or even impacts on the emotional well-being of humans and to the equally negative impacts on Wild Pigs and/or their habitats.

The Wild Pig's highly adaptable nature, along with its capacity to cope with landscape changes, and alterations of habitats, allows its populations to survive and thrive in human-dominated landscapes. An increase in the number and intensity of instances of Wild Pigs foraging on crops is an indicator of an increasing local Wild Pig population. With the availability of a variety of food resources, and high fecundity rates, a Wild Pig population can multiply at a rapid rate. Food crops and waste dumps aid the growth of Wild Pig populations. Another reason for the increase in Wild Pig populations in recent years is also linked to declining or low populations of natural predators and consequent increases in HWPC. Habitat loss and fragmentation are the major threats faced by the species.

Wild Pigs are among the most aggressive and persistent crop foragers. Wild Pig populations close to agricultural areas have become dependent on crops and agricultural produce. Human food waste also contributes to their increasing presence in forest-fringe areas. Humans also get injured when they encounter Wild Pigs accidentally. Isolated cases of Wild Pigs interacting negatively with livestock and causing injuries, and in rare cases death of livestock, have also been reported.

A key factor of HWPC may be the availability of only a limited number of effective mitigation measures. Therefore, the desired solution may involve a holistic approach that addresses the drivers and pressures, along with effective preventive measures, while reducing the vulnerability of local communities and Wild Pigs.

3. ADDRESSING THE DRIVERS AND PRESSURES OF HWPC

A systematic analysis of HWPC mitigation measures may be carried out to assess their effectiveness and wildlife-friendliness in different types of conflict situation. This will facilitate the customisation and adaption of mitigation measures/combining of two mitigation measures necessary to achieve the best possible impacts in the field.

3.1 ZONATION

Wild Pigs are often found frequenting agricultural lands on the periphery of protected areas or forested areas. Within a forest zone, Wild Pigs usually avoid interactions with humans. It is in the human-use areas and forest-village interface zone, i.e. forest fringes and agricultural settlements, that most of the HWPC cases are reported.

The following zonation takes into consideration the resources available and allows a science-based pragmatic approach to landscape-level planning for conservation and HWPC mitigation.

Zone 1 – Wild Pig habitat zone: This zone is in forested areas, and hence management interventions need to address and prevent habitat fragmentation and degradation. Humans venturing inside the forest may also encounter Wild Pigs, leading to aggression by the animals. In fragmented and degraded forest areas, habitat improvement activities such as reduction of biotic pressures and planting of native (forage) plants and vegetation cover for Wild Pigs may be carried out so that their existing forest populations are sustained. Further, identification of areas used by sounders for foraging, resting, etc. needs to be completed and activities that cause disturbances curtailed.

Zone 2 – Village–forest interface: Most of the Wild Pig populations in this zone are involved in agricultural losses and injuries or losses sustained by livestock and humans. There is an active need to manage the Wild Pig population in this zone. The SFD may work in close cooperation with local communities to achieve this as village panchayats are active stakeholders here. Most of the mitigation measures, such as barriers, fencing and other preventive measures, may be taken up in this zone. Long-term scientific management of Wild Pig population may also be planned for this zone.

Zone 3 – Wild Pig exclusion zone: In this zone, Wild Pigs live in refuges within agricultural fields away from forests. These Wild Pigs have adapted well to humans and live in patches of wasteland, village forests or agricultural fields. These populations have almost lost their connection with the adjoining forests. They have become entirely dependent on agriculture fields and waste dumps. Here they are joined by feral pigs, and frequent interbreeding is the norm. Scientific population management is most urgently required at these locations.

3.2 MONITORING AND MANAGING HABITAT-RELATED DRIVERS AND PRESSURES

Habitats suitable for Wild Pigs are not uniformly distributed everywhere in a forest, as a result of which these animals are active foragers of the forest floor. Moreover, Wild Pig resource preferences may vary from region to region. Further, habitat loss, fragmentation and degradation are some of the primary reasons why many wildlife species move out of natural habitats towards resource-rich human-use areas when searching for food. There has been a widespread loss of forests to the expansion of agriculture and plantations and increasing human habitations. With such forest losses, the original Wild Pig habitats have also disappeared or have been fragmented.

- Refuge areas inside villages, or nearby, support populations of both Wild Pigs and their hybrids. Thus, all Wild Pig habitats, whether within forests or refuge areas in villages, may be monitored regularly. The existence of a Wild Pig refuge in a village forms a source of HWPC. Thus, efforts may be made to reduce or remove the Wild Pigs from such habitations.
- In forested areas, critically important Wild Pig habitats such as foraging areas, resting areas and scrub forests may be monitored. Uncontrolled non-timber forest produce (NTFP) collection may lead to degradation of the forest habitats. All such collection may be monitored annually. The SFD may also collect data on the amounts/weights of different NTFP collected from different forest beats as these are good indicators of extraction levels.
- Due to the dominance of invasive alien plant species (weeds) that out-compete native vegetation for space, there may be a reduction in the native palatable woody shrub cover and suppression of native tree species. In time, with competition between humans and Wild Pigs for forest resources, these changes may result in increased HWPC. SFDs may map and monitor the invasive species cover and abundance in the landscape periodically and make further plans for invasive species removal accordingly.

- Unsustainable extraction of NTFPs, especially fruits and nuts (natural food items of Wild Pigs), leads to a decrease in the overall resource availability and particularly the ability of Wild Pigs to sustain themselves inside forested habitats. Overexploitation and unscientific harvesting of NTFPs decrease the regeneration and productivity of natural forests. Apart from affecting the foraging habitat of Wild Pigs and other wildlife, it also leads to a gradual loss of livelihoods for forest-dwelling communities. The primary objective of any management intervention may be to bring about better livelihood opportunities and reduce the dependence of humans on forest biomass.

3.3 MEASURES TO STRENGTHEN CROSS-SECTOR COOPERATION TO BE INSTITUTIONALISED

Cross-sectoral cooperation for HWPC mitigation entails engagement of multiple stakeholders from different sectors and domains at the state level, at the landscape level and at the forest division/district level. Key stakeholders of HWPC mitigation include the SFD, the Agriculture Department and other institutions under the agriculture sector, the district administration, the Animal Husbandry Department, the Health Department, the Family Welfare Department, the Education Department, local schools and colleges, local hospitals, wildlife conservation and development NGOs, farmers' cooperatives and agricultural research and extension institutions.

- State-level coordination committees (SLCC), a landscape-level multi-stakeholder forum and district-level coordination committees (DLCC) may be used to strengthen the inter-agency coordination required for HWPC. A district-specific operational mechanism may be developed to address specific needs of HWPC mitigation.
- Safety audits[5] focusing on crop protection measures may be conducted each year, if feasible, to ensure that all act responsibly and to facilitate inter-agency cooperation.
- Coordination between the forest and agriculture sectors is important, and dedicated programmes at the national, state and district levels may be formulated to implement these guidelines effectively.
- Workshops, dialogues and training programmes for the local community, especially members of the PRI institutions, may be organised at all HWPC hotspots to ensure that there is a common understanding of the gravity of the situation when the option of scientific population management is to be exercised.

3.4 SCIENTIFIC MANAGEMENT OF WILD PIG POPULATION AT INTERFACE AREAS

A local overabundance of wildlife, including Wild Pigs, could be due to a reduction in the carrying capacity brought about by habitat loss and degradation and fragmentation of natural habitats. It could also be due to a rapid growth in the population. Or it could be a combination of both. It is therefore important to determine which factor is driving the overabundance so that the appropriate interventions can be selected.

- Managing a local overabundance of Wild Pigs requires good knowledge and data on population size, dynamics, ranging of various sounders, habitat variables, HWPC, etc.
- SFDs may work towards building both internal capacity and collaborations with research institutes and researchers to achieve the high standards of data collection and analysis needed for scientific population management. SFDs may adopt a robust population monitoring protocol and implement it using trained field staff members or in collaboration with research institutes or local universities/colleges.
- Naturally dispersing Wild Pig populations that have colonised new areas may be studied to assess if the knowledge obtained can translate into any viable solution or clues for scientific population management. Past dispersal may be reviewed in terms of injuries or losses of human lives, crop or property damage and other adverse impacts on the well-being of humans in and around the newly colonised sites, losses of Wild Pig lives (including captures) and Wild Pig population trends in terms of the management inputs and challenges faced.
- Wild Pig populations occupying plantations or farms may be translocated to a suitable area, where they can be monitored closely by SFD staff members.

5 A safety audit is a process for pro-actively and periodically evaluating the mitigation measures in place at a site for their effectiveness and wildlife-friendliness.

3.5 SUSTAINABLE GARBAGE MANAGEMENT AROUND PROTECTED AREAS AND AT HWPC HOTSPOTS

Food waste dumped close to forest edges is a major attractant to many wild herbivore and omnivores species, which are closely followed by the carnivores that prey on these. The Wild Pig is one species that is attracted to these high-energy food resources. Food waste dumps support very high numbers of Wild Pigs, which move into cultivated and non-cultivated areas of villages. Human-use areas lacking wild predators also support an unrestricted growth of Wild Pig populations. Sustainable garbage management is thus an effective measure in controlling the populations and movements of Wild Pigs within human-dominated landscapes.

- Village panchayats on forest fringes may ensure that garbage dumps are not located close to the forest edges and that there are ecologically sound garbage storage and disposal plans. Wild Pig access can be prevented by covering dumps and maintaining locked garbage dumps.
- When landfills are used for disposal, their designs may not only be sanitary but secure too. Landfill designs may incorporate environmental planning to ensure wildlife protection. A landfill may be securely fenced to exclude animals.
- Another environment-friendly way of reducing dumps would be to allow recycling of most of the material. Packaging materials and plastics contribute immensely to the bulk of the waste. Improvements in packaging materials and package disposal may be explored by the village panchayats and municipal councils.
- Some Wild Pigs have become habituated to foraging within the boundaries of villages and towns in their search for garbage or waste dumps. 'Aversion conditioning' may be tested to discourage this behaviour of Wild Pigs.
- The vegetable and food waste generated in weekly markets and food waste and garbage thrown along roads and railway lines passing through forests all attract Wild Pigs and other animals. SFDs may coordinate with the local administration for the overall organisation of such markets, waste management and disposal in such a way that the waste generated does not attract Wild Pigs.
- The importance of using public toilets may also be included in the community awareness programmes conducted for the villagers living close to the forests in order to minimise the risk to life. SFDs may coordinate with the local sanitation department to get toilets built (under the *Swachh Bharat Mission*), including proper drainage mechanisms, particularly at conflict hotspots.

3.6 SYSTEMATIC RESEARCH AND MONITORING ADDRRESSING HWPC

Data on the populations and distributions of Wild Pigs are very scarce. Data are only available from a few isolated protected areas, in the form of encounter rates or density estimates. Thus, there is an urgent need to assess Wild Pig populations, particularly in areas close to conflict hotspots.

- Monitoring is essential to establish the trend in the Wild Pig population of an area. Apparent indirect signs of Wild Pig activity such as rooting, dung and hoof marks may be used to record the presence/relative abundance of Wild Pigs in an area. The various methods adopted for Wild Pig population monitoring include sign surveys, tracking plots, capture–recapture methods using camera traps and E-eye.
- Population monitoring of Wild Pigs may be conducted mainly in agricultural and forest-fringe habitats. It will be useful to assess the populations at the hotspots regularly, particularly before and after the implementation of mitigation measures. In the future, such population estimation may be a major deciding factor in allowing scientific population management of overabundant Wild Pig populations.
- For effective long-term scientific population management, and identification and selection of appropriate sounders within the conflict hotspot, information about their home range, habitat use and ranging patterns is critical.
- For any assessment of a species (and populations) at any (local/regional) scale, it is essential that baseline information be generated on the status and distribution of the species and its interactions with various (human and non-human) communities. Camera-trap monitoring, not only in protected forests but also at their interface with agricultural areas and even selected vantage spots in agricultural fields, may provide a more detailed and better estimate of the Wild Pig population and a better understanding of the behavioural ecology of the species.
- Systematic monitoring is also needed at hotspots or crop-foraging zones to study the intensity of conflict, crops affected (qualitative/quantitative), distance from forest/refuge, group size/composition of crop-foraging Wild Pigs, etc. to assess conflict intensity levels at various sites and prioritise sites for conflict mitigation.
- The current Wild Pig population densities at a hotspot, the demographic structures of various populations and general behaviour may be thoroughly quantified before any scientific population management intervention is attempted. Wild Pig movements and ranging patterns,

the reproductive behaviour of the animals and their age–sex ratios over time also need to be examined throughout the country.

- To monitor trends and the efficacy of the *ex gratia* payment, data may be collected and analysed in collaboration with other stakeholders, as appropriate.

3.7 MEASURES TO STRENGTHEN THE SYSTEM OF KNOWLEDGE MANAGEMENT IN HWPC MITIGATION

- To ensure that HWPC mitigation measures are effective, wildlife-friendly and sustainable, it is essential that field experiences, learnings, field-evidence and conceptual advances, especially related to crop protection measures, be not only shared between key stakeholders and landscapes but also documented to be utilised for future strategies and plans related to HWPC mitigation.
- Landscape-level multi-stakeholder fora and appropriate working groups may be used to share field experiences, learnings, evidence and conceptual advances within the Forest Department, between stakeholders and across landscapes.
- Measures may be put in place to systematically document field experiences, learnings, field-evidence and conceptual advances related to HWPC mitigation to inform future strategies and plans.

4. DEPLOYING MEASURES TO PREVENT HUMAN–WILD PIG CONFLICTS

4.1 MAPPING HWPC HOTSPOTS AND MONITORING THE POPULATIONS AT HOTSPOTS

HWC hotspots are areas with actual or predicted repeated occurrences of HWC incidents that result in crop-loss, livestock death, human death and injury, and wildlife death and injury over temporal and spatial scales.

- Identifying conflict hotspots that could also provide a direction towards the drivers of conflict is critical for providing site-specific solutions for mitigating human–Wild Pig conflict. HWPC hotspots may be mapped through geospatial assessments by using both primary and secondary data, including time-series data. The hotspots can be identified and mapped as follows:
  - **Incident hotspot:** Frequency of occurrence of incidences over a specific period (such as previous 5 or 10 years), mapped over the target area. The data include the number of incidences of crop and livestock injury and loss, injury and death of humans.
  - **Vulnerability hotspot:** Cumulative index determined by overlaying past incidents, the vulnerability of the local community and the potential risk of the area.

It may not be feasible to attempt individual identification of a Wild Pig in a conflict situation beyond getting evidence (such as digging, uprooting, trampling or news on aggressive interactions with livestock or humans) of crop foraging by Wild Pigs. Therefore, mitigation measures may not be based on the individual-animal approach.

- Groups of Wild Pigs-in-conflict, when identified, may be characterised as casual (opportunistic) foragers or as repeated (obligatory) crop foragers.
  - Opportunistic foragers may be Wild Pigs in their natural range occasionally crossing the periphery of the forest into croplands, while obligatory foragers are Wild Pigs that exclusively inhabit croplands due to the sustained attractions.
  - Another way of identifying a group-in-conflict is by checking if particular populations are habituated to foraging particular sites/locations. This could help decide if relocating a sounder-in-conflict, if feasible, to another place, should be resorted to.

- The following steps may be taken to identify Wild Pig groups-in-conflict:
  - The movement area of the above-mentioned categories of Wild Pig within croplands may be first demarcated or mapped, including track-marks and other distinct signs, to confirm the presence and absence of Wild Pigs.
  - Investigate all conflict-related incidents within the region.
  - Deploy a number of cameras at strategic locations, if feasible and depending on the predicted movements of Wild Pig groups under observation.
  - Investigate the existing camera trap photo database, if available, and attempt to identify known individuals on the basis of any distinct morphological identification features. Prepare a short list of Wild Pigs for capture on the basis of frequency of occurrence of conflicts.

4.2 SUPPORT LOCAL COMMUNITIES IN CROP PROTECTION MEASURES

Education and awareness programmes may be carried out to sensitise the communities to using wildlife-friendly crop protection measures and to the need for continuous improvisation.

- Since historical habitat fragmentation and loss are very difficult to address, the most suitable mitigation measures for mitigating HWPC are effective crop protection measures, including fencing and crop guarding, to prevent Wild Pigs from venturing into croplands.
- Collaborative efforts by the SFDs and the agriculture sector, using new technology, are required to develop innovative crop protection measures.
- Traditional barriers, such as rubble stacks, rubble walls are chain-linked fences, may be used as Wild Pig-proof barriers. The raw materials needed for making such barriers are easily available and such barriers are effective in preventing other wildlife species as well.
- More recently developed barriers such as buried metal fences, diamond mesh grills, concrete fencing and solar fencing may be used for enhanced effectiveness. Seasonal/temporary fencing may be explored as an alternative, as permanent barrier fences may interfere with many ecological processes.
- As animals such as Wild Pigs may get habituated to deterrents quickly, there is a need to keep improvising and changing deterrents, along with the regular crop-guarding methods used by the community. Mixing and alternating methods randomly may also be tried so that the Wild Pigs do not get used to any particular method easily.
- There are other exclusionary devices and methods also that may be used to prevent Wild Pigs from entering the crop fields:
  - Visual (colourful, shiny plastic ribbons) or acoustic deterrents
  - Scare devices (beating of drums or empty tins)
  - Planting of thorny bushes around the crop area (Euphorbia, Opuntia, Agave species)
  - Coconut ropes soaked in olfactory deterrents

4.3 EFFECTIVE USE OF THE RAPID RESPONSE TEAMS AND AWARENESS MEASURES

HWPC mitigation usually does not necessitate the involvement of Rapid Response Teams, except in situations where mass capture and rehabilitation are required. Having well-functioning Community PRTs can help address the situation.

- Community PRTs and RRTs may hold regular meetings, along with village panchayats and municipal councils, for reviewing the HWPC and for joint preparedness to handle any large-scale HWPC exercise in the future.
- Community PRTs or personnel from the affected community may be suitably trained in humane aversion or driving techniques and provided with support to implement the same in their localities whenever required.
- Besides involving local communities and various stakeholders in mitigation of HWPC, making them aware of Wild Pig behaviour is extremely important to avoid any accidental encounters.
  - Creating awareness and presenting demonstrations of effective Wild Pig-proof fences through institutions for effective HWPC mitigation
  - Encouraging communities to change cropping patterns or growing crops that are not preferred or are less preferred by Wild Pigs, or even combinations of crops (growing preferred ones in rows or guarded by non-preferred crops) conflict hotspots.

4.4 SCIENTIFIC MANAGEMENT OF WILD PIG POPULATION AT HWPC HOTSPOTS

Effective mitigation measures along with capture at HWPC hotspots can reduce the impacts on crop fields.

Mitigation measures leading to elimination of Wild Pig populations from a landscape with natural habitats may not be beneficial for the health and stability of the overall agro-ecological system in the landscape. Such measures may be implemented at forest-fringe areas and human-dominated landscapes only after long-term studies have been conducted and field-evidence of the possible ecological impacts has been collected.

Site-specific solutions are required, depending on whether the Wild Pig population comes from the adjoining forests or is resident entirely on the farmland. The population connected to a forest may be a part of the prey base of the predators inhabiting the natural forest. Therefore, any mitigation measure that results in a significant reduction of the Wild Pig population may affect the predator population as well.

In addition, another factor that could determine the nature of the mitigation measures is whether the population consists of small isolated herds or it is a large contiguous population occupying a large area.

4.5 ADDRESSING ZOONOTIC AND OTHER EMERGING DISEASES, TAKING A ONE HEALTH APPROACH

Handling wild animals invariably involves a zoonotic risk. Wild Pigs adapt to different types of habitat and forage on different types of food, in addition to their behaviour of alternating between forested and human-use areas, leading to disease transmission.

- It is also important that transmission of diseases from domestic animals and feral pigs to Wild Pigs and eventually to other wild animals in the forests be prevented by reducing the interactions of these animals.
- The veterinary capacities and infrastructure may be upgraded to facilitate disease-monitoring in Wild Pig populations for conservation and for prevention of the spread of zoonotic diseases to livestock and human populations.
- A well formulated Wildlife Health Management and Disease Surveillance Plan may be in place at every division/protected area.
- All the personnel involved in capture operations may be trained, vaccinated and equipped.
- The basic approach may be to integrate the concept of One Health[6], which links human and animal health in a shared environment, into all the operations and HWPC mitigation measures in the field.

6 One Health is a collaborative, multi-sectoral and trans-disciplinary approach—working at the local, regional, national and global levels—with the goal of achieving optimal health outcomes, recognising the interconnection between people, animals, plants and their shared environment.

5. ADDRESSING THE EMERGENCY SITUATIONS ARISING DUE TO HWPC

Emergency or crisis situations can be defined as situations that are sudden and unexpected, have the potential to be serious in nature and therefore require immediate interventions in time and space from concerned stakeholders to minimise the loss of lives and assets.

This is an indicative list of potential emergency situations:

- A Wild Pig has killed/injured a person.
- A Wild Pig has damaged property/crops.
- A Wild Pig has entered a human-use area (agricultural field or settlement area).
- A Wild Pig has been injured or has died due to retaliatory action.

Key response procedures may be established, and actions may be promptly implemented for addressing emergency situations. Detailed step-by-step guidance may be developed as 'Operating Procedures for Addressing Emergency response Situations'.

The key emergency response procedures may include the following.

5.1 ESTABLISHMENT OF EMERGENCY RESPONSE MECHANISM

- A robust mechanism to promptly trigger an emergency response may be established in all HWC hotspots. The mechanism may include early detection of the incident to communication with key officials and information dissemination for initiation of appropriate response actions at the site.

5.2 INTRA- AND INTER-AGENCY COORDINATION AND COOPERATION

- Procedures may be laid down in each HWPC hotspot, in line with these guidelines, and in line with the institutional framework suggested under the HWC-NAP, to ensure timely coordination amongst the various response teams (the Forest Department, Agriculture Department and agricultural institutions, District Administration, the Police, the fire services, the Animal Husbandry Department, the Health Department and the local community, especially local panchayat leaders and community PRTs).

5.3 PREPAREDNESS OF RESPONSE TEAMS

- Detailed operating procedures may be laid down to ensure that various response teams (community PRTs, RRTs) are adequately established and they are facilitated in their capacity development through training and other measures, including training sessions on occupational health and safety.

5.4 ACTION AT THE ONSET OF AN EMERGENCY OR SPECIFIC SITUATION

- Operating procedures may be laid down to receive, channelise and disseminate information at the onset of any emergency from the site of the incident to related forest officials and the HWC Mitigation Hub. The information may be disseminated further to requisition a related response action at the emergency site.

5.5 KEY RESPONSE ACTIONS DURING AND AFTER AN EMERGENCY

- Operating procedures may be laid down, in line with the other guidelines issued by MoEF&CC, for stepwise key actions, for all emergency situations, media engagement, crowd management, addressing health emergencies and post-response operation for management of the animal. This includes ensuring the animal's health and safety during capture, transport, selection of a translocation site and monitoring the animal after the animal is released safely into the wild.

6. REDUCING THE IMPACT OF HWPC ON THE HEALTH AND OVERALL WELL-BEING OF HUMANS

6.1 ADDRESSING THE SITUATION OF LOSS OF HUMAN LIFE

- Part of the *ex gratia* payment may be made immediately to the victim's family/heirs, and the balance payment may be made at the earliest.
- The payments to the victim's family should be made into their bank accounts.
- In the HWPC hotspots, a revolving fund may also be established, at the division-level, to ensure that funds are available for providing immediate relief to the victim/family.

6.2 ADDRESSING THE SITUATION OF LOSS OF LIVESTOCK

Loss or injury of livestock due to HWPC is occasional or rare.

- A livestock insurance scheme, additionally covering accidental injury or death from interactions with Wild Pigs, as with wild carnivore species may be facilitated by the SFD, in collaboration with the Animal Husbandry Department. Livestock loss may also be compensated by replacement with good-quality high-yielding livestock if adequate funds are available.
- Stall-feeding of cattle may also reduce their venturing into the forest and encountering wild animals such as Wild Pigs. Besides reducing the chances of loss of livestock to wild carnivores, stall-feeding also reduces the spread of zoonotic diseases from wild populations to domestic animals.

6.3 ADDRESSING THE SITUATION OF LOSS OF CROP/PROPERTY

Key manifestations of HWPC is damage to crops, property (damage to fences, houses, etc.) and other assets (livestock injury/death). Rarely, encounters may lead to human injury or death. The crop damage due to Wild Pig activities varies from state to state. Therefore, different measures may be implemented as per the situation:

A wide range of approaches could be envisaged that encourage local communities to live and prosper in a Wild Pig habitat. These approaches may be based on the principles of co-existence, co-management, participatory planning, risk assessment, strategies used to change perceptions, poverty alleviation programmes, community-based natural resource management and other forms of stakeholder engagement.

- Collaborative efforts may be made to promote market-based arrangements for alternate crops, wherever feasible. Community PRTs may be engaged to facilitate this process in their respective villages/areas of operation.
- The process of settling *ex gratia* payment for crop or property loss should be transparent and simplified.
- Mobile apps should be used for collecting the information and processing the claims of farmers related to crop damage caused by Wild Pigs to ensure that there is efficiency and transparency in the system.
- Farmers may be encouraged and facilitated through community-based institutions to explore solutions such as changes in cropping patterns and the use of crops that are non-palatable to Wild Pigs.
- Site-specific studies may be conducted in collaboration with agricultural research institutes to find appropriate crops that are non-palatable to Wild Pigs, and for finding effective crop guarding methods.
- The Ministry of Agriculture and Farmers Welfare has included crop depredation by wild animals under its flagship scheme, Pradhan Mantri Fasal Bima Yojana (PMFBY). This scheme may be used as an important HWPC mitigation instrument.
- Dialogue may be initiated with the insurance sector for providing insurance cover for damage due to HWPC. Insurance can be considered for damage to standing crops besides injuries/loss of life sustained by human beings. The modalities may vary for such insurance from place to place according to the assessment of risk by the insurance companies. The feasibility at the state level may also be explored.

7. REDUCING THE IMPACT OF HWPC ON THE HEALTH AND WELL-BEING OF WILD PIGS

7.1 OVERALL MEASURES

All care should be taken to address the issues of animal welfare and animal rights as enshrined in the Constitution (Articles 48A and 51A(g)) and the statutory provisions of the Indian Penal Code (Sections 428 and 429), the Prevention of Cruelty to Animals Act of 1960 (Section 11(1)(h) and Section 11(1)(d)), the Motor Vehicles Act, 1978 (Transport of Animal) Rules, 2001) and guidelines issued by the MoEF&CC.

7.2 ADDRESSING THE HEALTH AND WELL-BEING OF WILD PIGS DURING CAPTURE AND TRANSLOCATION

Translocation of captured Wild Pigs to a new location can also translocate the HWPC to that location if the governing factors are not kept in mind. Therefore, decisions relating to release sites may be based on scientific data (e.g., an area where the species is not present should thus be avoided; areas where other populations of the Wild Pig are present should be reviewed.

The decision about translocation, lifetime care or the use of any scientific population management method on captured Wild Pigs needs to be taken much before the capture operation, ideally at the planning stage itself.

- All captures may be planned and executed with utmost care as these procedures carry the risk of injury to both the animals and the handler/staff members involved.
- Driving (herding) and loading methods may be standardised through repeated testing.
- The capture equipment should be manufactured or procured as per specifications provided by the MoEF&CC or the relevant national institutions. Field staff should be trained in the use and regular maintenance of the equipment. Customised vehicles may be designed for transporting captured Wild Pigs immediately from the capture site to a rescue centre/ lifetime care or translocation site.
- If captured animals are released in the wild, they may be marked for identification (using RFID tags, if available and feasible), and all encounters may be recorded and reported to a central database. If the number of translocated animals is large (100 or more), a monthly assessment of the numbers released may be made to ascertain the status of the population. Identification-marking during the release may facilitate post-capture monitoring for getting information for decision-making mitigation measures.

8. USE OF LEARNINGS FROM THE GUIDELINES TO FURTHER STRENGTHEN INSTITUTIONAL AND POLICY FRAMEWORK ON HWPC MITIGATION IN INDIA

These guidelines are expected to serve as a capacity development instrument, given that a robust and structured feedback mechanism will be put in place to document the feedback arising from their implementation.

- The feedback arising from the use of these guidelines may, therefore, be consolidated to form the basis for fine-tuning these mitigation measures and for understanding capacity needs for effectively implementing the mitigation measures.
- In the long term, the consolidated feedback may also be used in further review of the capacity development strategies, HWC-MAPs, HWC-SAPs and HWC-NAP.

9. PROCESS OF DEVELOPMENT, PILOT-TESTING OF THESE GUIDELINES AND THE CONSULTATION PROCESS

- A dedicated framework of experts (Annexe 1) was formed that consisted of representatives of Government agencies, SFDs, research institutions, civil society institutions and international organizations and independent wildlife policy experts. The experts were a mix of scientists, wildlife managers, policy experts and capacity development experts.
- A common understanding was developed on the overall purpose, scope, approach and methodology[7]. The experts played different roles in the drafting and editing process (Coordinating Lead Authors, Lead Authors, Contributing Authors, Review Editors). The Author Group worked on developing these guidelines between July 2019 and February 2022, during which time they consulted a larger group of experts and stakeholders via workshops, meetings and consultations. The authors reviewed the documents and guidelines available from the MoEF&CC and different states, and relevant information and recommendations were brought into this new document. A National Technical Group (NTG), consisting of experts from MoEF&CC, Wildlife Institute of India (WII) and *Deutsche Gesellschaft für Internationale Zusammenarbeit* (GIZ) and independent wildlife and policy experts, was formed for the overall steering and facilitation of the process. A 'Working Group on Pilot Implementation of Guidelines and HWC-NAP' was formed to facilitate the planning and implementation of the pilot testing, consultations and final editing of the draft guidelines and the HWC-NAP. Detailed terms of reference were provided, and meetings and workshops of the author groups were facilitated under the Indo-German Cooperation Project on Human–Wildlife Conflict Mitigation.
- The draft guidelines and HWC-NAP were pilot tested at selected HWC hotspots in India to receive feedback on the feasibility and acceptability of the recommendations expressed in the guidelines, using structured processes and tools. On the basis of the feedback received during fortnightly meetings and one-to-one consultations with managers, the draft of the guidelines was revised.
- A Committee was constituted by MoEFCC in December 2022, consisting of officials from MoEFCC, and the state forest departments of Bihar, Haryana, Karnataka, Tamil Nadu, Uttarakhand, Uttar Pradesh, West Bengal to review and finalize the guidelines.

10. MONITORING AND EVALUATION OF GUIDELINES

- This set of guidelines is not a static document; rather, it is a living document. It will keep abreast of the various developments in field implementation methods and wildlife research. For this to happen, the feedback from field practitioners and other wildlife experts may be analysed to assess the specific elements and sections that need to undergo changes. A review of these guidelines is planned to take place every 5 years from 2023 onwards. However, a mid-term review process may be desirable in 2024. In the long term, the review cycle of these guidelines can be aligned with the review cycle of HWC-NAP.
- The mechanism, templates and guidance for collating information and feedback on the use of these guidelines may be elaborated.

7 Approach paper: https://indo-germanbiodiversity.com/pdf/publication/publication19-04-2021-1618808050.pdf

ANNEXE 1

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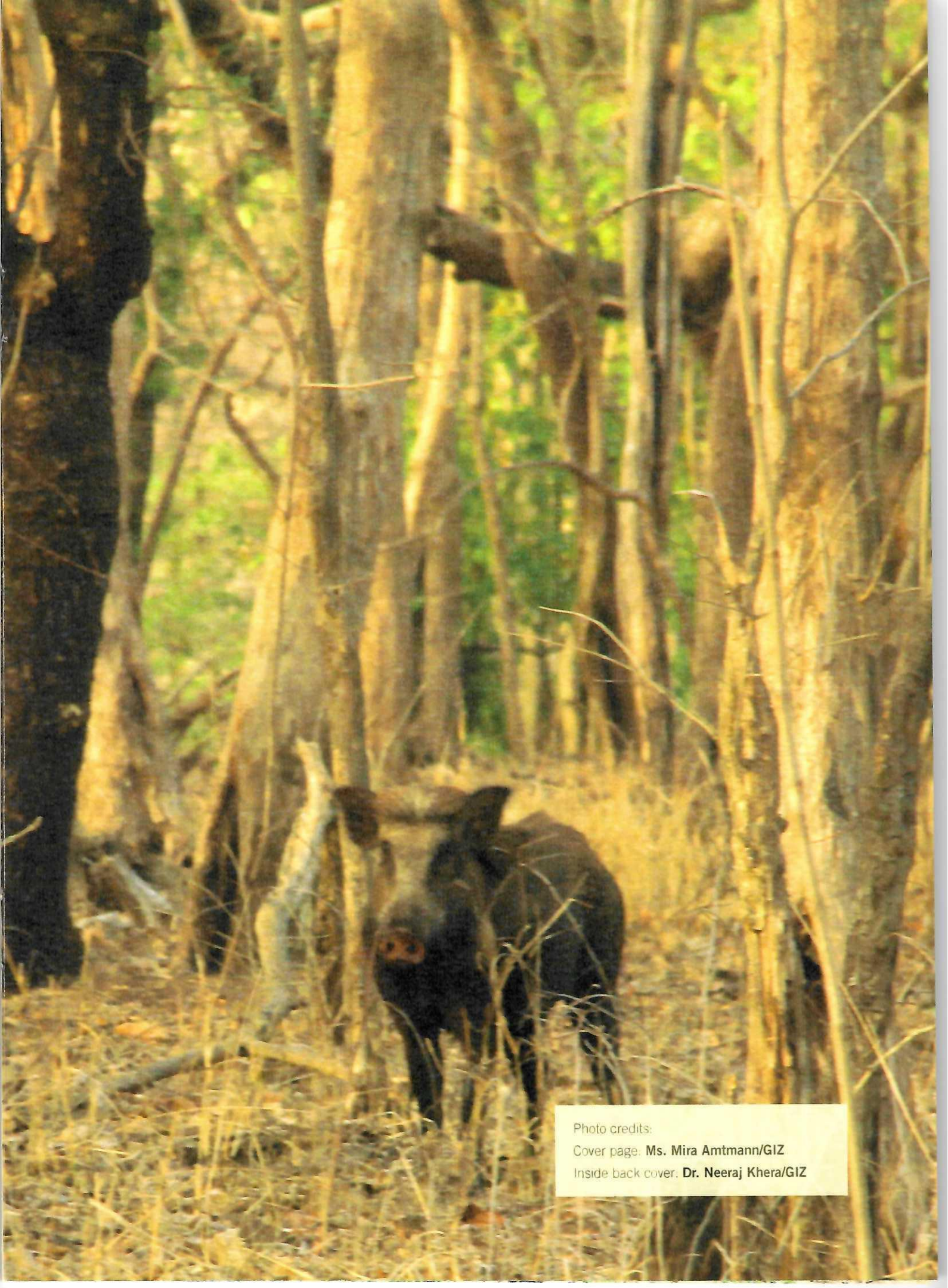

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