



Government of India



Guidelines for Mitigating Human–Snake Conflict

Taking a Harmonious Coexistence Approach



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Ministry of Environment, Forest and Climate Change



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Abbreviations

ANM	Auxiliary nurse midwife	IFS	Indian Forest Service
ASHA	Accredited social health activist	IUCN	International Union for Conservation of Nature
AWW	Anganwadi worker	JFM	Joint forest management
BMZ	German Federal Ministry for Economic Cooperation and Development	MoEF&CC	Ministry of Environment, Forest and Climate Change, Government of India
CPR	Cardiopulmonary resuscitation	MoHFW	Ministry of Health & Family Welfare
CCTV	Closed-circuit television	NCDC	National Centre for Disease Control
CWLW	Chief Wildlife Warden	NDRF	National Disaster Response Force
CZA	Central Zoo Authority	NGO	Non-governmental organisation
DBT	Direct benefit transfer	NTCA	National Tiger Conservation Authority
DFO	Divisional Forest Officer	NTG	National Technical Group
DLCC	District-Level Coordination Committee	NWAP	National Wildlife Action Plan
EDC	Eco-development Committee	OPs	Operating procedures
EIA	Environmental impact assessment	PA	Protected area
EWRR	Early Warning and Rapid Response	PCCF	Principal Chief Conservator of Forest
GIS	Geographical information system	PPE	Personal protective equipment
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit	PRT	Primary Response Team
Gol	Government of India	RFID	Radio frequency identification
HOFF	Head of Forest Force (in a state)	RRT	Rapid Response Team
HSC	Human—snake conflict	SDRF	State Disaster Response Force
HWC	Human—wildlife conflict	SFD	State forest department
HWC-MAP	Human–Wildlife Conflict Management Action Plan	SHG	Self-help group
HWC-NAP	National Human–Wildlife Conflict Mitigation Strategy and Action Plan	SLCC	State-Level Coordination Committee
HWC-SAP	State-Level Human—Wildlife Conflict Mitigation Strategy and Action Plan	SOPs	Standard operating procedures
IDSP	Integrated Disease Surveillance Programme	STG	Standard Treatment Guidelines
		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 on human—snake conflict (HSC) mitigation get the overall context from the Wild Life (Protection) Act, 1972, National Wildlife Action Plan (2017—31)¹ and National Human—Wildlife Conflict Mitigation Strategy and Action Plan (HWC-NAP) (2021-26)². HWC-NAP provides the overall conceptual and institutional framework for implementing the guidelines. This document takes into consideration the existing policies, guidelines, advisories and good practices issued by the Government of India and various state governments related to HSC mitigation.
- These guidelines take into consideration the Prevention and Control of Snake Bite Envenoming in India, being implemented through the National Health Mission by the Ministry of Health & Family Welfare (MoHFW), Government of India.
- The following guidelines are to provide guidance on selected species: guidelines for mitigating human—Leopard, -Elephant, -Gaur, -Crocodile, -Wild Pig, -Bear, -Blue Bull, -Rhesus Macaque and -Blackbuck conflicts.
- Also, the following guidelines on cross-cutting issues are to provide guidance on selected issues: Guidelines for Forest—Media Cooperation; Occupational Health and Safety; Crowd Management in HWC-Related Situations; and Addressing Health Emergencies and Potential Health Risks Arising Out of Human—Wildlife Conflict Situations: Taking a One Health Approach.

1.2 PURPOSE AND SCOPE

- These guidelines aim to facilitate a common understanding of what constitutes effective and efficient mitigation of HSC in India that will lead to harmonious coexistence. The guidelines are meant to ensure standardisation in performing mitigation operations in the most effective and efficient manner, with minimum damage to humans and snakes.

- The guidelines provide advice on mitigation measures to be used to address HSC in the long term as well as facilitate the development, assessment, customisation and evaluation of site-specific HSC mitigation measures that are effective and wildlife friendly.
- The guidelines serve as a basis for overall long-term planning and coordination of HSC mitigation measures at the national, state and division levels.
- In general, the guidelines apply to all stakeholders relevant to HSC mitigation and are not limited to the state forest departments.
- 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-coexistence³ approach to ensure that both humans and snakes are protected from the negative impacts of HSC.
- The guidelines address the issue of HSC, 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 HSC; providing guidance on establishing and managing prevention methods; and reducing the impact of the conflict on both humans and snakes.
- The development of these guidelines and the intended implementation are driven by a participatory approach. These guidelines are intended to facilitate participatory planning, development and implementation of HSC mitigation measures with key sectors and stakeholders at the national, state and local levels.
- The guidelines facilitate a landscape approach when formulating measures for mitigating HSC to ensure sustainable solutions as unless comprehensive and integrated HSC mitigation measures are implemented

¹ MoEF&CC (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 interaction on humans or on their resources and on the wildlife or on their habitats. The mitigation measures designed using this approach maintain a balance between the welfare of animals and that of humans in which both are given equal importance. Overlap in space and resource use is managed in a manner that minimises conflict.

across the landscape, the problem is likely to only shift from one place to another.

- 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 implementation by providing the *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 Wild Life (Protection) Act, 1972.
- The following laws are considered directly relevant for conservation when dealing with HSC:
 - Wild Life (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 WLP Act 1972 are especially relevant when dealing with HSC.
- The Supplementary Framework to HWC-NAP on Legislative Framework for HWC Mitigation in India⁴ may be referred to for more details about the specific legal provisions related to HWC mitigation.
- Other important laws that facilitate conservation when dealing with HSC include the Environment Protection Act, 1986; Indian Penal Code, 1860;

Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006; Indian Forest Act, 1927; Forest (Conservation) Act, 1980; Environment (Protection) Act, 1986; and Disaster Management Act, 2005.

1.5 INSTITUTIONAL FRAMEWORK FOR IMPLEMENTING THE GUIDELINES

- The institutional mechanism outlined in HWC-NAP will be followed for implementing these guidelines.
- The implementation of these guidelines may be anchored in each district, at the District-level Coordination Committee (DLCC) chaired by the respective District Collector, where the system of regular feedback and fine-tuning of the protocols and processes will be done to customise these to suit the local conditions.
- Apart from this, the Ministry of Health & Family Welfare has recently approved the implementation of Prevention and Control of Snake Bite Envenoming in India through the National Health Mission, with the provisions of all states and UTs receiving funds through the Annual Programme Implementation Plan (PIP) mechanism of the National Health Mission (NHM). The National Centre for Disease Control (NCDC) is the implementing agency for the same. The measures supported are provision of anti-snake venom through the National Free Drug Initiative, capacity building of health, veterinary and wildlife professionals, advocacy for inter-sectoral coordination with veterinary and wildlife professionals, IEC activities for community awareness on prevention of snake bites, etc.

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

Snakes are an integral part of the ecosystems in which they operate, and are related to humans in direct as well as indirect ways. Snakes play a significant role by feeding on a wide range of animals. At the same time they also serve as prey to other animals. Some snakes are expert rodent hunters, controlling a significant population of rodents that are otherwise inaccessible to other predators. Snakes, unlike most wild animals, are more likely to share the living space with humans in rural and urban landscapes alike, in extremely close proximity. Notably, some of these snake species are potentially dangerous to humans. Close encounters of humans with snakes are, for the most part, inevitable, as these animals (including venomous species) have successfully adapted to live close to human habitations that provide easy prey. These species are either pulled into such habitations in search of prey or are pushed out of natural habitats due to fragmentation and destruction of the same.

The abundance of a particular species of snake varies spatially and temporally. Young snakes (just after hatching, till they get settled in a particular territory) are naturally more abundant than adults. Similarly, highly adaptable species tend to be more abundant than the habitat specialists. The distribution and abundance of snakes also vary across landscapes and habitat types. They also vary with the adaptability of a snake to rapidly changing habitats.

In ideal conditions, snakes are secretive and are mostly encountered randomly/accidentally inside human settlements, or they may get detected when their microhabitats are disturbed through earth-moving, construction, farming activities, etc. In rural areas humans very often encounter resting snakes when removing fuelwood, cow dung or bricks from piles. Such spots offer warm and safe microhabitats for many snakes. Temporally, the chance of encounter is high during the rainy season, when snakes come out of their burrows/ hideouts due to flooding. Snakes are encountered more frequently when they find human habitations to be safe and warm places for over-wintering or for egg-laying or for easy prey-hunting (house rodents).

Venomous species, such as Russell's viper, the binocellate cobra and the common krait prefer dry areas, while the monocellate cobra and banded krait prefer moist areas such as wetlands, water-logged areas and

swampy habitats. The saw-scaled viper prefers dry, rocky terrain, scrub forests, rock piles, etc. On the basis of their activity, snakes can be classified as diurnal, nocturnal or crepuscular. However, most HSC incidents happen when humans encounter snakes outside their actual activity period. In a natural ecosystem, snakes do have inter-species competition for food and resources, and they avoid encounters. For example, rat snakes and cobras, being the most common snakes encountered near human habitations and being competitors for food and resources, often avoid each other. Hence, sensitising humans to coexist with the non-venomous rat snake might save them from the deadly cobra.

The Big Four venomous snakes, causing the maximum morbidity are the spectacled cobra (*Naja naja*), common krait (*Bungarus caeruleus*), Russell's viper (*Daboia russelli*) and saw-scaled viper (*Echis carinata*). Other than these, in general any snake (of any species) encountered by the public is likely to be harmed in retaliation, out of fear. Among the Indian snakes, some species of harmless snake mimic the venomous ones, and some even display various intimidating defensive behaviours. In such cases, if such harmless snakes are not rescued immediately by a trained rescuer, they may also be at high risk of being killed in retaliatory action by humans or out of fear.

Snakebite affects more humans than many other 'neglected tropical diseases' and often causes death, disability or disfigurement. At the global scale, the World Health Organization (WHO) has included snakebite as a neglected tropical disease. WHO's global strategy emphasises a combination of approaches, such as empowerment and engagement of communities, improved access to modern health facilities and better cooperation and coordination among stakeholders at the local, regional and national levels.

Challenges in mitigating HSC are more complex than any other species-in-conflict. With the enormous increase in the human population, coupled with habitat loss and habitat degradation, the frequency of human-snake interactions has also increased rapidly.

3. AWARENESS MEASURES TO PREVENT ACCIDENTAL ENCOUNTERS AND TO REDUCE RETALIATORY OR PREVENTIVE KILLING OF SNAKES

Educating people and increasing awareness about snakes and snakebites is one of the major pillars of HSC mitigation efforts, as considering the frequent negative interactions of snakes with livestock and humans, a general public perception of snakes is that they are 'vicious, dangerous and unwanted' wild animals. In such a situation, it is important that their conservation and management be based on a greater understanding of human perception about snakes, snake behaviour and life history parameters in general and of the causes of HSC in particular. Only through such education and awareness creation will the public reconcile themselves to sharing their space with snakes in a mutually beneficial way.

Local public engagement is a vital aspect of an HSC mitigation programme. In the multi-tier collaborative initiative (from the grassroots level to the panchayat and SFD levels), humans (farmers, students, medical professionals) are important stakeholders.

- In natural habitats that are surrounded by rural and natural resource-dependent human populations, the HSC problem is compounded. With humans whose livelihoods are dependent on sharing the habitat and its resources with snakes, HSC is an inevitable and unavoidable consequence. Circumstances in which humans or their livestock might directly encounter a snake may be clearly communicated to people living in such habitat so that such encounters are minimised or avoided.
- Media reports portraying snakes in a negative image are detrimental to their conservation and to effective management of HSC. Therefore, the education and awareness measures may also be extended to the media personnel, and every effort may be made to facilitate them in developing a common understanding of the key HSC issues and mitigation measures.
- Reader-friendly signage, pamphlets, posters and other educational outreach material containing snake photographs, written in the vernacular languages of the region, may be developed and distributed.
- Specific programmes on raising awareness on snakes behaviour and their roles in ecosystems, snakebite management (including snakebite-

related first-aid measures and treatments) may be implemented for farmers, other farm workers, women's groups, school and college students, and other such vulnerable groups may be conducted on a regular basis.

- Such awareness programmes may focus on raising the awareness of the public about snakes and snakebite avoidance and safety in areas where venomous snakes occur, through appropriate awareness and communication measures, including the following.
 - At the community level, snakebite first-aid kits and snake awareness material with clear pictures of common snakes found in the locality and highlighting coexistence principles can be provided to village-level community centres.
 - Periodic awareness programmes may be conducted by involving accredited snake rescuers.
 - Identifying persons as snake rescuers and providing them with snake rescue kits may also help reduce the conflict at the village or community level.
- Specific awareness measures and training in snake identification and snakebite management for frontline health workers and health sector professionals, healthcare professionals and paramedical staff members working in PHCs and government hospitals may be organised on a regular basis.
- The community engagement may also include measures to ensure that effective traditional practices that are wildlife-friendly are further enhanced, while unethical and unscientific practices are discontinued and discouraged. Traditional healers may be sensitised about the consequences of delayed treatment of snakebite.
- In areas where snake rescue programmes are not operational, snakes may be killed in preventive killing by humans, irrespective of the species. Hence, by intensifying awareness measures, coupled with the enhanced capacity of the field response teams involved in rescue operations, preventive killing of snakes may be reduced.

- Efforts may be made to integrate awareness material in the overall training curriculum of the *Krishi Vigyan Kendras* (KVK), State Institute of Rural Development (SIRD) and Panchayati Raj Institution (PRI).
- Awareness programmes may be implemented in and around protected areas and zoos in coordination and collaboration with the Ministry of Health and Family Welfare and the respective state health departments.
- Use of mobile applications may be promoted to strengthen the publicly available information on snakes.
- Identification manuals may be developed to facilitate people in correctly identifying snake species.
- Awareness material on snakes in regional and local languages may be developed and distributed by the SFD with the help of experts and snake rescuers. Such material can be distributed at public gatherings at taluk, block and sub-division headquarters, PHCs, CHCs and other hospitals. Biodiversity Management Committees (BMCs) at local levels may also include primary health workers like accredited social health activists (ASHAs), auxiliary nurse midwives (ANMs) in the committee.
- Books and radio and television talks by experts can be extensively used to spread positive awareness messages about snakes. Information communication technology (ICT) tools can also be used.
- Snake encounters can happen at odd times. In such cases, help from a trained snake rescuer is vital in locating the snakes, rescuing them, releasing them into their natural habitats and, most importantly, creating awareness among the gathered public about the snakes.
- Snake encounters may be reduced to a large extent by taking measures such as sealing door gaps and drainage outlets, clearing campus premises and packing up holes and burrows made by rats and termites, getting rid of rodents and toads from houses, etc. In villages, firewood and cow-dung piles can be stored outside houses, and care and caution may be taken when extracting material from them for use. Fine wire-meshes on windows are very useful in keeping out snakes. The use of mosquito nets is a must for humans sleeping in tents, on the ground, etc. Frequently used roads and paths may be adequately lighted. Torch lights may be used when going out at night, especially dirt roads and mud paths. Farmers may take precautions during crop harvesting. During winter or on cold days, snakes can be spotted basking in the sun on stone paths and tar roads, at warm spots inside houses, in warehouses/godowns/storehouses and in other snake-friendly areas.
- Mobile phone-based apps are very useful for reaching out to the urban public. Such apps can guide snakebite victims or their helpers to proper emergency procedures and treatment and can help save precious lives. This will not only provide access to urgent advice from experts on the treatment protocol but also consolidate data on snakebites into one platform. However not all victims go to hospitals, even in urban areas. Hence it is important to initiate community-based studies to get an accurate picture of snakebites and the morbidity and mortality involved so that proper treatment and management of snakebites can be achieved. Such mobile apps can help strengthen the information on snakes and help identify different species of snake.

4. STRENGTHENING THE ROLE OF KEY STAKEHOLDERS AND FACILITATING CROSS-SECTOR COOPERATION

The role of the key actors, viz., the SFDs, the district administration, the Panchayati Raj Institutions and the Medical/Healthcare Department, is critical in effectively addressing HSC.

- SFDs—relating to snakes (wildlife): deal with the actual animals involved in HSC
- District administration/Panchayat Raj Institutions—relating to humans: deal with the persons involved in HSC, community PRTs
- Healthcare professionals—relating to treatment: deal with managing and treating snakebites (government hospitals, private hospitals, PHCs)
- Effective coordinate on HSC among these actors though the District-level Coordination Committees (DLCCs) may be facilitated.
- A database of hospitals may be developed, with their contact details and locations, on a GIS map, and this may be made available to the public, through various media/publications, by the respective SFD and district administration. This database may be regularly updated.
- PHCs may strengthen their snakebite treatment facilities (polyvalent snake antivenin serum (PASV), ventilators, etc.). As a safety measure, the PHCs and CHCs may keep an adequate, steadily replenished stock of snake anti-venom and other necessary drugs (to control anaphylactic, pyrogenic and serum sickness reactions) for use during any emergency.
- The SFD offices may maintain up-to-date information on the availability of anti-venom within their jurisdictions.
- Other key stakeholders such as the local community, academic institutions, panchayat members, snake rescuers and the medical staff may be engaged effectively. When required, support from law enforcement departments and disaster management teams may be availed of through the local administration.
- New real estate sites often cause habitat destruction for snakes, mainly through digging and earth-moving activities. In this regard, advisories should be developed by the SFD for such sites to compensate the habitat loss to wildlife caused by such activities. The advisories should be science-based and technically supported by data on the presence of local wildlife species. SFDs can establish an advisory group of local institutions, NGOs and experts for such technical support in specific divisions/landscapes where such cases are frequent.

5. SYSTEMATIC RESEARCH AND MONITORING FOR HSC MITIGATION

While snakes are among the most common predators in ecosystems, they also serve as important prey in the same ecosystems. These characteristics have led to the evolution of interaction patterns between snakes and other prey species. Studies on the above-mentioned aspect have not yet carried out in India except for two radio-telemetry studies on the king cobra conducted recently by the Agumbe Rainforest Research Station (ARRS) and a telemetry study on the Indian rock python conducted by the Wildlife Institute of India (WII) in the Moyar River Valley, Tamil Nadu. These studies have provided insights into snake biology in the country.

Snake rescue activities provide ample opportunities for scientific studies and population monitoring. Crucial information on the distribution of snakes and on the natural history, basic biology and ecology of species can be generated by systematically documenting each case.

- Case studies pertaining to size, sex, biological condition and weight of species; feeding habit and food spectrum; rescue techniques and preventive measures; and frequency of recapture of marked individuals are examples of some of the parameters that can be obtained from the rescue operations. Eventually these can provide a deeper understanding of the drivers of the conflict.
- The presence of abundant prey species (i.e., rodents, amphibians and poultry species) around human habitations and agricultural fields attracts snakes to such areas. This makes human–snake encounters inevitable.
- It is imperative to know the behavioural changes in rescued snakes once they are released to a new environment that may lead to conflicting situations.
- Studies are also important to understand the dynamics of snake–human conflict, and data gathered by the rescuers and SFD may be analysed to find out site-specific drivers of conflicts.
- Large snakes sharing similar niches face a high degree of competition, and hence areas naturally inhabited by one species (for example the rat snake) have a very low density of the other species (for example, the cobra) and vice versa. Furthermore, removal of one species may result in immigration of other species. Hence, inter and intra-species competitions in snakes need a deeper understanding

to predict HSC in a particular area.

- It has been recently established by a study that there is regional variation in the venom composition of a particular species. Hence, scientific research into the structure and composition of venom in the regional context is very important. Out of Big Four, if two (saw-scaled and Russell's viper) are not present in the region, production of bivalent anti snake venom to cover neurotoxic bites of cobras and kraits can be considered. It is important to recognise the regional issues in snakebite and its management.
- Each division may facilitate volunteers and researchers to gather first-hand field data on the distribution of snake species in their respective areas, with support from key stakeholders, as follows:
 - Experts from local universities/colleges may be engaged once a year to survey the areas that have some degree of vegetation cover, e.g., near lakes/water bodies, hillocks, social forestry (SF) zones, cultivated lands and farmland, to generate or update local inventories of snakes and also to identify suitable release sites.
 - Range RRTs may conduct road-cruising surveys at night, especially during the monsoon, to inventory the snake species present, to quantify wildlife loss due to anthropogenic factors and to map HSC hotspots.
 - Local hospitals may be facilitated to collect data on the status and prevalence of snakebite cases, on the availability and stock of snake anti-venom. They may also be facilitated to convey these details to local HWC Mitigation Hubs on a regular basis.
- Experts and institutions may be facilitated to develop and use the mobile applications on collecting snake distribution data, and HSC maps can be generated from the rescue reports that are stored in the mobile apps. The apps may be designed to provide a digital guide about the species found in each region on the basis of the GPS location of the user's device. There may be a provision in the app to share images with other users for identification of a snake species. Sharing of the data with the Health Department data repository may be facilitated.

- Experts and institutions may be engaged to identify release sites for rescued snakes of key species in the area. The IUCN release protocols may be used as the guidelines for identifying such release sites. This research may facilitate a change in the current practice of releasing large numbers of rescued snakes at a single location to a more scientific release protocol, on based on species and habitat studies.
- Experts and institutions may be facilitated in monitoring potential release sites. Such sites may be demarcated for long-term monitoring of snake species. Ecological information (availability of hideouts/shelters, prey base, cover, water sources, carrying capacity, presence and abundance of various snake species, etc.) may be studied to designate an ideal relocation site. There may be adequate vegetation cover in and around release sites to cushion a snake's shock of release into a new, unfamiliar location. This may ensure that snakes do not stray out from release sites immediately after release, back into human settlements, in search of their basic life requirements. Researchers/biologists may be engaged along with the front-line staff (watchers, guards and foresters) in conducting an annual vegetation cover evaluation in such release sites.
- **Identifying conflict hotspots⁵** (which could also provide a direction towards the drivers of conflict) is critical to provide site-specific solutions to mitigate HSC. HSC conflict hotspots may be mapped through geospatial assessments, by using both primary data and secondary data, including time-series data. Hotspots can be identified and mapped as follows.
 - Incident hotspot: Frequency of occurrence of incidences over a specific period in the past, such as 5 or 10 years, mapped over the target area. The data include the number of incidences of injury and death and crop and property damage.
 - Vulnerability hotspot: Cumulative index determined by overlaying past incidents, the vulnerability of the local community and the potential risk of the area.
- The field data gathered by the snake rescuers may be used for generating such hotspot maps, apart from the data collected through the mobile applications.

6. SNAKE-VENOM COLLECTION

- It is up to a State's CWW under S-12 (d) of WPA (1972) to grant permission (on payment of stipulated fees), by an order in writing, stating the reasons, to any person to hunt any wild animal (in this case, snakes), subject to conditions for the purpose of deriving, collection and preparation of snake venom for the manufacture of life-saving drugs, with the permission of the Central Government for Schedule I species and of the State Government for any other wild animals (schedule II-IV). The number and species of snakes to be captured, quantity of venom to be extracted, geographical area, period and snake rehabilitation are to be specified in the order.
- The holder of the permit needs to submit periodical reports detailing the number of snakes captured and the quantity of venom extracted and supplied to institutions producing anti-venom drugs. The designated field officers may also undertake periodic inspection to ensure that trauma is not caused to the snakes during the capture and release operations and that the snakes are rehabilitated in the same habitat from where they were captured⁶.
- Funds provided by the Ministry of Health and Family welfare, through the National Free Drug Initiative, for the implementation of Prevention and Control of Snake Bite Envenoming in India, under the National Health Mission, can be used for the measures to be taken towards this.

5 'HWC hotspots' are areas with actual or predicted repeated occurrences of HWC incidents resulting in crop-loss, livestock death, human death and injury and wildlife death and injury over temporal and spatial scales. The HWC can be static (repeated at the same place or time) or dynamic (shifting in space over years). In addition to count statistics, the magnitude of the incidents is subjected to interpolation or extrapolation techniques to define the hotspots in space and time.

6 The Irula tribe's snake catcher cooperative society in Tamil Nadu are traditional snake catchers and are involved in the extraction of snake venom to meet their livelihood needs, and after venom extraction, the snakes are monitored and rehabilitated as per the protocols.

7. FACILITATING CAPACITY DEVELOPMENT MEASURES TO DEVELOP THE REQUIRED COMPETENCIES FOR ADDRESSING HSC IN THE MOST EFFECTIVE AND EFFICIENT MANNER

Capacity development of SFDs, other line departments, local communities and all key stakeholders may be facilitated to ensure that a holistic approach is adopted:

- The SFDs may ensure that all response team personnel from the forest department and other line departments and agencies are brought under a systematic approach to capacity development, in line with the Supplementary Framework to HWC-NAP on Establishment and Capacity Development of HWC Mitigation Response Teams⁷.
- It may be valuable to establish a division-level honorary working group of professional herpetologists to support the response teams, on a case-to-case basis. This working group may also facilitate training programmes and other capacity development measures, such as mentoring and coaching the snake-experts in the response teams in the following aspects.
 - Supporting the SFD in identifying snake species (region-specific) and developing a pocket-book/ identification guide in the local language, along with a matching mobile app to facilitate response team members and general public in identifying snakes
 - Supporting the SFD in identifying potential snake microhabitats or niches, both in wild and humanized habitats
 - Supporting the SFD in the handling (capture and restraint) of live snakes, including the venomous ones
 - Supporting the SFD in developing short-term housing/shelters for such rescued snakes (when necessary)
 - Supporting the SFD in transportation of live snakes for bona fide reasons (from the capture site to a release site or to a veterinary clinic)
 - Supporting the SFD in identifying potential release sites on the basis of the distance from the site of capture, the extent of vegetation spread, the species of snake involved and the proximity of the targeted release site to human settlements
 - Supporting the SFD in liaising with veterinarians keeping in mind the possibilities that the snakes are wounded or injured during or prior to the initial capture
- In each forest division and range, there may be a need to identify the forest department staff and other volunteers from rural and urban areas who are interested in snake capture, rescue and rehabilitation. They may be imparted training to develop knowledge and skill to perform snake handling and rescue operations.
- Training of health workers to diagnose and carry out preliminary snake treatment measures may be essential. Training of the first-aid and ambulance personnel to stabilise and safely transport snakebite victims to a hospital is very important in saving the life of the victim.

⁷ Supplementary framework to HWC-NAP on establishment and capacity development of HWC mitigation response teams: <https://moef.gov.in/wp-content/uploads/2022/01/National-Human-Wildlife-Conflict-Mitigation-Strategy-and-Action-Plan-of-India-2.pdf>

8. ADDRESSING THE EMERGENCY SITUATIONS ARISING DUE TO HSC

8.1 OVERALL MEASURES

- Emergency or crisis situations can be defined as situations that are sudden, unexpected, have the potential to be serious (or are serious) in nature and therefore require immediate intervention in time and space, from concerned stakeholders, to minimise loss of lives and assets. In the present context, these would be situations that involve snakes in a position where any interaction can be potentially injurious or fatal to either humans or the snakes.
- An indicative list of the potential emergency situations on a priority basis is as follows:
 - i. Snakes taking shelter in a human habitation in case of floods
 - ii. Livestock/poultry bitten by a venomous snake
 - iii. Rescue of injured snakes
 - iv. Snakes entering human-use areas (agricultural fields or settlements)
 - v. A human has been killed/injured due to snakebite
 - vi. Snake death due to retaliatory action
- Key response procedures may be established and actions promptly implemented/undertaken for addressing emergency situations.
- A robust mechanism to promptly trigger the emergency response may be established at each forest division right from early detection of the incident to communication with key officials and information dissemination for initiation of appropriate response actions at the site of the incident. To ensure the safety of the humans and snakes involved in this interaction, a planned response is required.
- The snake emergency situations may happen very frequently throughout the year, and may be highest during the monsoon, with a reduction in the interaction during winter. They need to be dealt with through safety measures of the highest level, especially in case of a venomous species. During flood-like situations, the help of disaster management teams may be availed to reach out to humans and snakes in distress.
- Snake rescue is a process fraught with dangers, for both the rescuer and the snake itself. Although a snake's rescue may happen at 'odd times' (outside the natural activity period of a species), its natural

activity and habitat requirements are to be taken in to consideration when relocating and releasing the animal. For example, if a Russell's viper is rescued during the daytime, it has to be released in its appropriate habitat only during nighttime. Hence, it becomes necessary for the rescuers to have a basic understanding about the ecology, behaviour, habitat and prey of snakes. The training programme should provide specialised information about the snakes that are found in that area and its habitat. The most frequently rescued snakes include cobras, rat snakes and checkered keelbacks.

8.2 REDUCING THE IMPACT OF HSC ON THE HEALTH AND WELL-BEING OF THE HUMANS

8.2.1. Overall measures

- A majority of snakebite victims die unnatural deaths due to delayed access to well-equipped hospitals or unnecessary wastage of time in faith healing treatments or quackery. To prevent this, effective awareness and popularisation of government schemes for snakebite cases may help reduce the high mortality from snakebites and help the overall well-being of the humans.
- Venomous snakes may not be released in thickly populated areas. They may be released in designated or suitable habitats with the minimum possibility of human encounters, where they can survive after release. Such habitats may be identified and adequate warning signage put up to indicate the heightened presence of venomous snakes in the area.
- The SFD may assist and facilitate various measures, including any ex gratia payment, according to the state-specific rules by coordinating with hospitals and the district administration.
- Snake rescue is a professional task that involves higher levels of risk. A venomous snake's bite could be fatal or could cause severe damage to the rescuer's body. In many remote parts of the country, the treatment for a venomous snakebite might not be available within easy reach. In such zones, extra care may be taken by the rescuers when involved in rescue operations.

- Improving medical facilities at Primary Health Centres (PHCs) and Community Health Centres (CHCs), as well as improved ambulance services, may prevent snakebite deaths in such risk zones.
- Awareness of the availability of emergency treatment facilities for snakebites in government and private hospitals and of the availability of ex gratia payments in any government schemes or relief funds may be imparted to the communities.
- HSC equipment inventory development in the corresponding Divisional Forest Officer's (DFO) headquarters and in the subordinate offices may also be necessary. This involves stocking adequate equipment such as snake hooks, snake bags, safety boots and a region-specific pocket-guide/photo-album or manual for snake identification.

8.2.2. Addressing zoonotic and other emerging diseases, taking a One Health approach

- Snakebite envenoming is a neglected tropical disease (NTD) with a significant public health impact. The most vulnerable populations are those populations where the presence of venomous snakes overlaps with a lack of access to healthcare and effective treatment. Other than the venomous snakes, many harmless snakes also possess microbes and may act as vectors. Snakes live in habitats where various bacterial strains also exist. During handling of snakes or during snakebites, the oral microflora of the snakes may infect the bite victims. Pathogenic organisms carried by snakes greatly vary with species, season and geographical location. Usually, the relationship between snakebite and microbial infection is neglected during the treatment process. Hence, snake rescuers, the public and medical practitioners should be made aware of zoonotic diseases that may be transmitted due to snakebites.
- The following measures are envisaged at HSC hotspots:
 - Veterinary capacities and infrastructure may be upgraded to facilitate disease monitoring in wildlife populations for both wildlife conservation and prevention of zoonotic diseases in human populations.
 - A well formulated Wildlife Health Management & Disease Surveillance Plan may be in place at every division/PA.
 - All personnel involved in capture operations may be trained, vaccinated and equipped.

- HSC mitigation and snake rescue training may involve the respective state health department, and the standard treatment guidelines and snakebite (STG) guidelines developed by the Ministry of Health & Family Welfare may be followed.

The basic approach should be to integrate the concept of One Health⁸, which links human and animal health in a shared environment, into all the operations and HSC mitigation measures in the field.

8.3 REDUCING THE IMPACT OF HSC ON THE HEALTH AND WELL-BEING OF THE SNAKES

- Cruelty in handling wild animals such as snakes, careless transportation, unduly long possession and releasing snakes anywhere randomly without considering the basic requirements of the species are some of the common practices that are detrimental to the animals.
- Public displays, stunts with rescued snakes, illegal use of snakes for any other purpose and misuse of a permission for anything other than for rescue and relocation are to be treated as violations of WPA (1972).
- Rescuers who try to remove a snake from what is now its natural habitat should consider the unforeseen impacts on the micro-ecosystem due to the sudden and complete removal of a species.
- During the process of capture and translocation, the minimum trauma is to be caused to the snake. The person to whom the permission to hunt (capture and translocate) has been granted should ensure that the snake is not pushed into its burrow as this will cause injury and trauma to the snake.
- Rescue operations involve both cost and time. Hence sensitising humans to coexist with non-venomous snakes can prevent unnecessary rescue operations. The awareness of the community regarding the identification of snakes, necessary precautions to avoid snakebites and steps to be taken in case of snakebites are important in dealing with future situations better.
- If any exotic species of snake is sighted or rescued by a snake rescuer, this should be immediately brought to the notice of the concerned DFO. The snake needs to be captured and maintained in captivity.

⁸ 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.

- Non-venomous snakes should be released within their current home ranges. If an earmarked site is not available for the release, then a suitable habitat similar to the current habitat may be selected for the release.

8.4 EFFECTIVE USE OF EARLY WARNING AND RAPID RESPONSE SYSTEM AT HSC HOTSPOTS

Conventional early warning systems, as used for other species-in-conflict, are not usually warranted for snakes. The response system, however, may be strengthened in each division with a high level of HSC.

- The response teams may be trained in snake rescue operations. In addition to this, at HSC hotspots, a dedicated set of competent staff members, from the RRT personnel, may be specially trained in mitigating

HSC, including snake rescue operations, and provided with certificates at the end of the training for assisting with rescue operation.

- Volunteers may also be trained and engaged on a contractual basis, according to the feasibility, by the forest department during rescue operations.
- The RRTs may be trained for preventing HSC during floods and post-flood situations when snake encounters become numerous as lots of snakes are washed downstream and take shelter in human habitations for shelter and warmth.

9. USE OF LEARNINGS FROM THE GUIDELINES TO FURTHER STRENGTHEN THE INSTITUTIONAL AND POLICY FRAMEWORK ON HEALTH EMERGENCIES IN HWC SITUATIONS 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 by the DLCCs and state-level Coordination Committees (SLCCs) to document the feedback generated by the implementation of these guidelines.

- The feedback may, therefore, be consolidated to form the basis for fine-tuning the HSC mitigation measures and understanding the capacity needs for effectively implementing the inter-agency coordination mechanism and taking a One Health approach.

- In the long term, the consolidated feedback should also be used in further revision/updating of the capacity development strategies, Division-Level HWC Management Action Plans and national and state HWC Strategy and Action Plans.
- Feedback from the inter-agency teams will be used to further strengthen our understanding of the operationalisation of the One Health approach.

10. PROCESS OF DEVELOPMENT AND PILOT TESTING OF THESE GUIDELINES AND THE CONSULTATION PROCESS

- A dedicated framework of experts (Annexe 1) was formed, with the core team consisting of representatives of government agencies, SFDs, research institutions, civil society institutions and international organisations and independent wildlife policy experts. The experts were a mix of scientists, wildlife managers, public health experts, medical professionals, veterinary experts, policy experts and capacity development experts.
- A common understanding was developed on the overall purpose, scope, approach and methodology⁹ 10. The experts had different roles in the drafting and editing process, viz., as Coordinating Lead Authors, Lead Authors, Contributing Authors and Review Editors. The Author Group worked on developing these guidelines between July 2019 and August 2021, during which period 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 the new document. The National Technical Group (NTG), consisting of experts from the MoEF&CC, WII and GIZ and independent wildlife

and policy experts, was formed for the overall steering and facilitation of the process. The 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 HWC-NAP. Detailed terms of reference were provided for each category, and meetings and workshops of the Author Group 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 a structured process 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 the MoEF&CC in December 2022, consisting of officials from the MoEF&CC and the SFDs of Bihar, Haryana, Karnataka, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal to review and finalise the guidelines.

11. 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, 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 the guidelines is planned to take place every 5 years from 2023

onwards. However, a mid-term review process in 2024 may be desirable. In the long term, the review cycle of these guidelines can be aligned with the review cycle of HWC-NAP.

- A detailed mechanism, templates and guidance used for collating information and feedback relating to the use of these guidelines may be developed.

⁹ Approach paper: <https://indo-germanbiodiversity.com/pdf/publication/publication19-04-2021-1618808050.pdf>

¹⁰ Human-Wildlife Conflict Mitigation Instrument-Strengthening Capacities to Address the issues related to zoonotic and other emerging diseases: Taking a One Health Approach publication02-06-2022-1654169065.pdf (indo-germanbiodiversity.com)

ANNEXE 1

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