

# **PROCEEDINGS**

## **EXPLORING THE FEASIBILITY AND VALUE OF PIONEERING PARTNERSHIPS TO REDUCE AVOIDABLE SNAKEBITE DEATHS IN INDIA**



***[avoidable-deaths.net](http://avoidable-deaths.net)***

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**Contact:** [contact@avoidable-deaths.net](mailto:contact@avoidable-deaths.net)

**More information about Avoidable Snakebite Deaths Project:** [avoidable-deaths.net/ongoing-projects/project-pioneering-partnerships-to-reduce-avoidable-snakebite-deaths-in-india/](https://avoidable-deaths.net/ongoing-projects/project-pioneering-partnerships-to-reduce-avoidable-snakebite-deaths-in-india/)

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### **About Avoidable Deaths Network (ADN):**

ADN is a diverse, dynamic, inclusive, and innovative global-local membership network of experts, practitioners and researchers interested in avoiding human deaths from natural hazards, naturally triggered technological hazards and human-made hazards in low- and middle-income countries. ADN exists to help policymakers, researchers and practitioners make better decisions to save lives and reduce injuries to achieve sustainable development. ADN's purpose is aligned with the United Nations Sendai Framework for Disaster Risk Reduction's first two global targets and is a member of the [Sendai Framework's Voluntary Commitment Platform](#). On 12 March 2023, ADN launched a global campaign: [International Awareness Day for Avoidable Deaths \(IAD4AD\)](#) and the campaign slogan 'Disaster Deaths Are Avoidable'. This global campaign aims to raise the visibility of indirect disaster deaths and missing persons and to understand the causes and circumstances that lead to avoidable disaster deaths. This global campaign will be celebrated annually.

ADN was founded by Dr. Nibedita S. Ray-Bennett and Dr. Hideyuki Shiroshita and was launched in 2019 at the 4<sup>th</sup> Summit of the Global Alliance for Disaster Risk Institutes in Kyoto in Japan. ADN is based at the University of Leicester in the United Kingdom and Kansai University in Japan. For more details, please visit [ADN's website](#).



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## Acronyms

ADN	Avoidable Deaths Network
KEN	Knowledge Exchange Network
NGO	Non-governmental organisation

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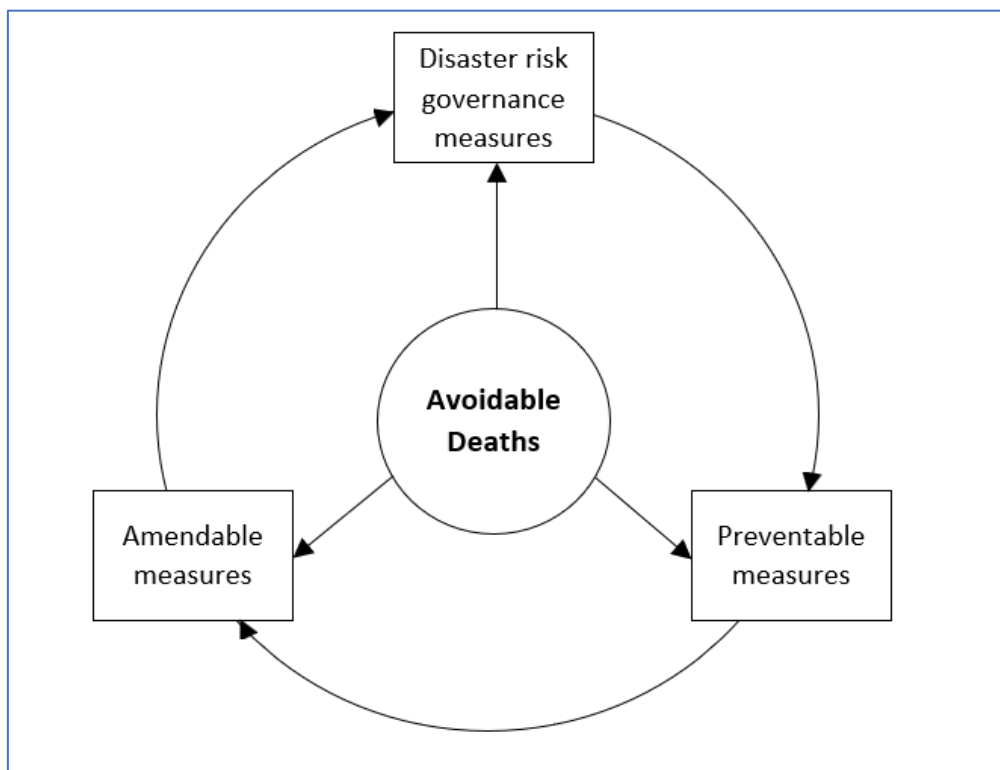


## Context: Avoidable Snakebite Deaths

### Problem

Avoidable deaths are premature deaths, consisting of three categories: preventable, amenable/timely, and risk governance-related avoidable deaths. To reduce avoidable deaths, category-tailored interventions are required. These categories and category-tailored measures are coined as the **Avoidable Deaths Framework** (see Figure 1) (Ray-Bennett and Shiroshita, 2023).

**Figure 1: Avoidable Deaths Framework**



Preventable measures include public health measures, surveillance, outreach, screening, health teaching, social marketing, and policy development (Kent State University, 2020).

Amenable or treatable interventions involve reducing wait times and harmful delays for both those who receive and those who give care (National Academy of Sciences, 2001). Both amenable and preventable measures can be enhanced through robust and effective disaster risk governance.

Disaster risk governance is “the way in which public authorities, civil servants, media, private sector, and civil society at community, national and regional levels cooperate, coordinate, collaborate to manage and reduce disaster and climate-related risks’ and ensures “sufficient levels of capacity and resources are made available to prevent,

prepare for, manage, and recover from disasters” (United Nations Development Programme, 2012, p.1; Alam and Ray-Bennett, 2021).

Reducing avoidable disaster deaths and the number of people affected by disasters is an emerging scientific field, and is currently the first two Global Targets of the United Nation’s ‘Sendai Framework for Disaster Risk Reduction 2015-2030’ (Ray-Bennett, 2017, 2018), which are:

- Sendai Target A: “Substantially reduce global disaster mortality by 2030”.
- Sendai Target B: “Substantially reduce the number of affected people globally by 2030.” (United Nations, 2015)

These two targets work at the interface with several Sustainable Development Goals: 3 (Good Health and Well-being), 11 (Sustainable Cities and Communities), 13 (Climate Action) and 17 (Partnerships for the Goals).

A particularly pressing area of opportunity for reducing avoidable deaths is *snakebite deaths in India*. Snakebite is a neglected tropical disease (NTD) that results from the injection of venom, a specialised toxic secretion, into humans by the bite of a venomous snake. According to World Health Organisation (2023), about 5.4 million snakebites occur each year, resulting in 1.8 to 2.7 million cases of envenoming. India accounts for approximately half of all global snakebite deaths reported through traditional surveillance systems, and about 2.97 million snakebites incidences occur each year (Gutiérrez *et al.*, 2017). Around 58,000 snakebite deaths and a further 140,000 incidents leading to various disabilities, including limb injuries and amputations, occur annually in India (Gutiérrez *et al.*, 2017).

The states of Bihar, Jharkhand, Madhya Pradesh, Odisha, Uttar Pradesh, Andhra Pradesh, Gujarat and Rajasthan carry the highest burden of snakebite deaths in India (*aka* eight high-burden states). About 75% of deaths in India occur before reaching hospitals due to mechanical, cultural, and economic hurdles (Mohapatra *et al.*, 2011). Additional barriers include antivenom-resistant snakebite due to regional-, inter- and intra-species proteomic differences, unavailability of healthcare in time of need, and the influence of traditional healers. These are **avoidable deaths**.

A more recent study in India found that most snakebite deaths occur in rural areas (94%) and at home; and half of all deaths occurred from June - September during the Southwest monsoon season (Suraweera *et al.*, 2020). This season is notorious for flooding in the South Asian sub-continent. This find is consistent with another study in Bangladesh, which found snakebite was the second largest cause of death in the 2007 floods (Paul, 2021). These deaths are considered **indirect disaster deaths**.

Another study conducted by Ray-Bennett (2006) in the village of Tarasahi in Odisha, found that snakes appear everywhere during floods, dwelling in dry places and on roofs and doors because flood water has entered their snake holes. Floods, therefore, increase the likelihood of snake-human encounters and the risk of snakebites. According to Paul (2021, p.92), “snakebite is a more common cause of flood deaths

in developing countries, while it is rare in developed countries”. Reducing snakebite deaths, therefore, warrants investigating the **causes and circumstances** of disaster deaths under the ambit of the disaster risk reduction framework.

The latest World Bank Group (World Bank, 2021) *Climate Risk Country Files* projected that even under lower emissions pathways within the Paris Climate Agreement, nearly all Asian countries face an increase in the frequency of extreme river flows. This projection implicates snakes as they are connected to this environment. Extreme heat and extreme river flows are likely to increase human-snake exposure and encounters, leading to **avoidable disaster deaths**. The avoidable deaths approach provides a valuable pathway to integrate into disaster risk management, health, and human systems to reduce human-snake conflict and save lives from floods or other hazards.

## Odisha

The Disaster Management Act of India (2005) defined disaster as:

*“a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or man-made causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area”* (Government of India, 2017: Section D, p.4)

Since snakebite is considered an *accidental death*, as such, it has come under the category of *other disasters*.

In 2015, Odisha became the first state in the country to declare snakebite death as a state-specific disaster. As per the Government of Odisha’s two latest *Annual Reports of Natural Calamities 2021-2022 and 2020-2021*<sup>1</sup>, 1,888 people died of snakebites across 30 districts of Odisha (with Ganjam district bearing one of the highest numbers of snakebite deaths) as compared to other disaster deaths – 572 from lightning, 2,546 from drowning, 51 from floods and 3 from cyclones (see *Table 1: Disaster Deaths*). Snakebite and drowning are the two major causes of disaster deaths in Odisha.

The Government of Odisha has been exemplary in reducing cyclone disaster deaths from 10,000 in 1999 to 86 in 2014 (Ray-Bennett, 2017; 2018) and a further reduction to three deaths between 2020 and 2022 (Government of Odisha, 2022). Large numbers of snakebite and drowning deaths suggest that it is important for the Government of Odisha to prioritise reducing these avoidable disaster deaths. Snakebite deaths have reduced mildly between 2020 and 2022, but it suggests that urgent research and interventions are warranted to reduce these **avoidable snakebite**

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<sup>1</sup> Annual Report of Natural Calamities for the year 2019 is unavailable and the previous reports do not provide data on snakebite deaths.

**disaster deaths** under the ambit of the Honourable Chief Minister, Mr. Naveen Patnaik’s state mission statement: ‘Zero Casualty at Any Cost’.

**Table 1: Disaster Deaths**

(Government of Odisha, 2020-21; 2021-22)

<b>Timeline</b>	<b>Snakebite</b>	<b>Lightning</b>	<b>Drowning</b>	<b>Flood</b>	<b>Cyclone</b>
2021 - 2022	844	281	1209	13	3
2020 - 2021	1044	291	1337	38	0

## Solution

There are several ongoing projects in India. The Indian Snakebite Project is working to revolutionise anti-venom production in India (Martin, 2016). Ophirex, Inc., a US-based Public Benefit Corporation, has been working on their lead compound, varespladib, a direct toxin inhibitor of sPLA2, the most enzymatically active toxin in 95% of the world’s venomous snakes. The molecule has been specifically identified by the World Health Organisation Snakebite Envenoming Working Group to warrant accelerated development to reduce morbidity and mortality from snakebite. Ophirex, Inc. is currently evaluating varespladib-methyl as an oral antidote for snakebite envenoming from any snake species, from multiple geographies through a phase 2, multicentred, randomised, double-blind, placebo-controlled study. Ophirex, Inc.’s goal is to develop varespladib to meet the unmet medical need, address the limitations of *anti-snake venom*, and provide a safe and effective therapy at an affordable cost (Carter *et al.*, 2022).

The Madras Crocodile Bank Trust and Centre for Herpetology’s Snakebite Mitigation Project is working towards increasing education and awareness through rural outreach services; venom sampling and characterisation; mapping of medically important snakes; and identifying health facilities with adequate stocks of anti-venom and experienced health workers (Whitaker, 2019). The George Institute for Global Health, and the Indian Council of Medical Research Regional Medical Research Centre in Bhubaneswar, examined the policies and systems of those addressing the burden of snakebite in Odisha and West Bengal (The George Institute for Global Health India, 2019). The University of Reading’s Pharmacy Division led a household survey and several prevention projects (including diagnostic kits and alternative therapies) in Tamil Nadu (Vaiyapuri *et al.*, 2013). Other studies have investigated the influence of socio-economics and worked to develop a better estimate of the burden in Bihar, Tamil Nadu, West Bengal, Maharashtra, Kerala, and Himachal Pradesh (Bawaskar *et al.*, 2008; Suchithra *et al.*, 2008; Vaiyapuri *et al.*, 2013).

The Odisha State Disaster Management Authority has constituted a committee to oversee the implementation of its Snake Bite Reduction Programme. The core

committee is headed by the executive director of Odisha State Disaster Management Authority (OB Bureau, 2022). Under this programme, the reducing snakebite deaths model developed by the Demow Rural Community Health Centre in Assam, is trialled in Odisha. This model consists of a Venom Response Team, Fast Response Team, and snakebite room, as well as a WhatsApp group to inform about snakebite incidences and seek emergency healthcare<sup>2</sup>.

In light of these projects, the Avoidable Deaths Network's project – led in collaboration with 14 organisations<sup>3</sup> - is unique because it aims to identify, map and assess the feasibility of context-specific, key stakeholders to bring them into a **knowledge-exchange network (KEN)** platform to foster i) dialogue and discussions within and across three Indian states (Assam, Odisha and Madhya Pradesh); ii) coordination, cooperation, and communication amongst responders for resource-sharing and response at local levels; iii) identify scope for transformative research that combines social, medical and space sciences; and iv) improve the capacity of local stakeholders.

Furthermore, we explored the feasibility of the **KEN** platform under the ambit of the Sendai Framework for Disaster Risk Reduction's Targets A, B and E (disaster risk governance – mentioned above) and Sustainable Development Goals 3.8, 3B-D.

The Sendai Framework for Disaster Risk Reduction and Sustainable Development Goals targets are consistent with the World Health Organisation's Snakebite Envenoming Strategy for Prevention and Control, which aims to: i) halve the number of deaths and cases of disability by 2030; ii) empower and engage communities; iii) strengthen health systems; and iv) increase partnerships, coordination, and resources (Nuñez *et al.*, 2019).

The objectives of this study were:

- 1) To identify all the key stakeholders who can reduce avoidable snakebite deaths across three states of India from the village to sub-district to district and state levels;
- 2) To engage with these key stakeholders through a stakeholders' consultation and symposium;

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<sup>2</sup> WhatsApp exchanges with the Principal Investigator of the reducing snakebite deaths model, Dr. Surajit Giri – who also collaborates on the Avoidable Snakebite Deaths Project.

<sup>3</sup> The project is led by Dr Nibedita S. Ray-Bennett in collaboration with 14 organisations: University of Leicester, PeerConnect, Kansai University, Sheffield University, All India Institute of Disaster Management, Orissa State Volunteers Social Worker's Association, Tata Steel, Kalahandi University, Doers, Zoological Survey of India, Indian Council of Medical Research, Indian Council of Medical Research - National Institute of Research in Tribal Health, Demow Rural Community Health Centre, Snake Helpline and All India Institute of Medical Science. Additionally, 11 gatekeepers (Champions/ Convenors) were gained during the project, including nine institutions (Ophirex, Inc., Climate Resilient Observing-Systems Promotion Council, Amrita Institute of Medical Sciences and Research Centre, Premium Serums, Madras Crocodile Bank Trust and Centre for Herpetology, Himachal Pradesh State Institute of Health and Family Welfare, EMRI Green Health Services, and Bongaigaon Civil Hospital) and two independent snake rescuers.

- 3) To engage with local communities to understand their help-seeking behaviour and explore what kind of networking will be required to reduce avoidable snakebite deaths in the village to sub-district to district levels; and
- 4) To explore the feasibility and value of a pioneering knowledge exchange 'network to reduce avoidable snakebite deaths' across three high-burden states.

## Methods

To achieve these objectives, the qualitative methods of stakeholder mapping, interview, focus group discussion, consultation, symposium, and high-level round-table meeting were triangulated to increase the reliability and validity of our data.

To map stakeholders, we developed two stakeholder mapping tools:

- Mapping Tool A for National- and State-Level Stakeholders
- Mapping Tool B for District-, Sub-District-, and Village-Level Stakeholders.

We implemented these tools in three states – Odisha, Assam, and Madhya Pradesh – chosen for their pre-existing connection to ADN. To ensure that each participant was a dedicated member of the Indian snakebite community, at least 10% of the sample was selected from other Indian states. Data were collected from January to June 2023 (see **Table 2**).

**Table 2: Timeline of Data Collection**

Methods	Timeline	National/ State	District/ Sub-District/ Village
Secondary Literature Review	January to June 2023	✓	✓
Stakeholder Mapping	February to April 2023	✓	
Stakeholder Mapping	May to June 2023		✓
Meetings (Virtual)	February to June 2023	✓	
Virtual Consultation (Mentimeter)	25 May 2023	✓	
Two-Day Symposium, Bhubaneswar	20-21 June 2023	✓	✓
High-Level Round Table Meeting, New Delhi	23 June 2023	✓	

We also used a model of one district, one-sub district and one village of the same district model (see **Figure 2**).

**Figure 2: One District Model**

<b>One District Model</b>			
<b>Sample selection strategies</b>			
<b>1<sup>st</sup> group sample:</b> Three states out of the eight high-burden states were selected, namely: Odisha, Madhya Pradesh, and Assam.			
<b>2<sup>nd</sup> group sample:</b> One District, Sub-District and Village were selected in each of the sample states:			
<b>State</b>	<b>Odisha</b>	<b>Madhya Pradesh</b>	<b>Assam</b>
<b>District</b>	Ganjam	Seoni	Bongaigaon
<b>Sub-District</b>	Kodala Tehsil	Lakhnadon Tehsil	North Salmara
<b>Village</b>	Burujhari	Purwa	Kayethpara

This report provides highlights of the two-day symposium and the high-level round table meeting. Before that, the report outlines some key findings of our Objectives 1 and 2 below. This is because the findings of Objective 1 informed the organisation of the two-day symposium and the round-table meeting. The findings of Objectives 3 and 4 at the community level could not be shared because data collection was still ongoing during the symposium dates.

Furthermore, this proceeding report has been prepared upon request from the Honourable State Minister of Rural Development, Skill Development and Technical Education Odisha, Mr Pritiranjan Gharai.

Therefore, the purpose of this report is to enlighten the Honourable State Minister about this project as well as identify a few actionable recommendations to reduce avoidable snakebite deaths in Odisha with relevance for other high-burden snakebite states.

## Key Findings

### Objective 1

We identified 127 stakeholders (see **Table 3**) using Mapping Tool A. All these stakeholders were invited for a virtual consultation. Of these, 21 participants attended the consultation on 25 May 2023.

**Table 3: Stakeholders by State**

State(s)	Number	Percentage
Odisha (sample)	25	20%
Assam (sample)	34	26%
Madhya Pradesh (sample)	25	20%
Other	39	31%
Outside India	4	3%
Total	N = 127	100%

### Objective 2

#### Stakeholder Categories

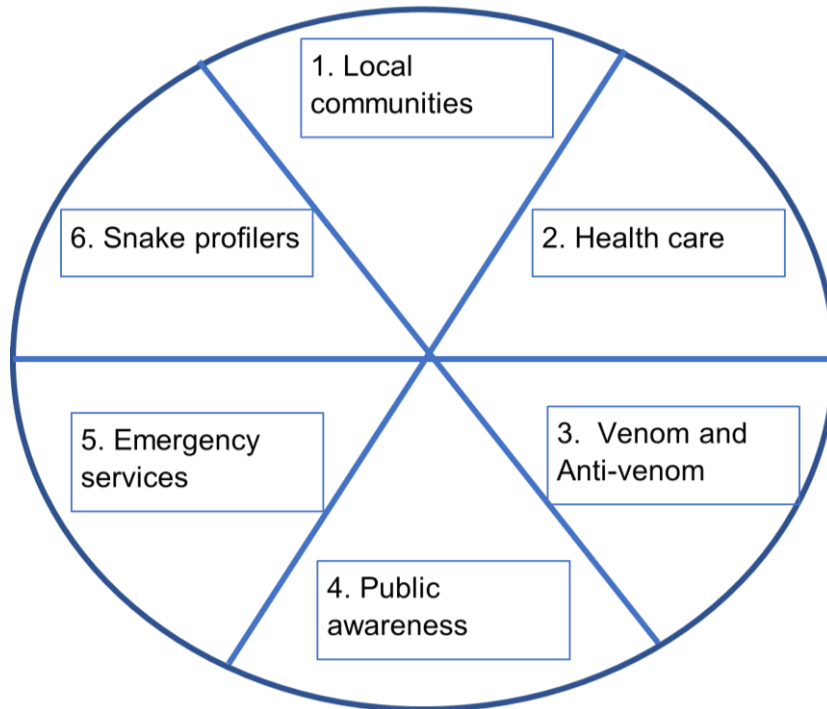
The stakeholder mapping led to the development of six evidence-based emergent stakeholder categories. These categories are (please see **Figure 2**):

1. 'At-risk' local community responders (Accredited Social Health Activists, traditional healers, victims)
2. Health Care (medical researchers, providers, policy, guidelines/ protocols, insurance)
3. Venom and anti-venom (*irulas*, researchers, producers, supply chain)
4. Public awareness, educators, funders, activists
5. Emergency services (ambulance, police, disaster risk managers)
6. Snake profilers (behaviour and habitat specialists)

Participants from each category were invited. During the consultation, feedback was given and each category was further refined.



**Figure 3: Categories of Stakeholders**



Expert speakers from each stakeholder category were invited to attend the Two-Day Symposium in Odisha and the High-Level Round Table Meeting in New Delhi. Details of these events are provided below.

## Highlights

### Two-Day Symposium: Brainstorming Workshop

The Two-Day Symposium kickstarted with a Brainstorming Workshop at Hotel New Marion on 20 June 2023 from 10:00 to 16:00. The Brainstorming Workshop was attended by 41 people, including ADN members, based both internationally and in India; experts who were invited to present on the second day; and the Odisha-based snakebite community. Participants were invited by Dr. Nibedita Ray-Bennett (Principal Investigator, Avoidable Snakebite Deaths Project) and Mr. Dillip Pattanaik (Lead, ADN India Hub).

The Workshop was organised by the [ADN India Hub](#), which is hosted by the Orissa State Volunteers and Social Workers Association. The Workshop was chaired by the ADN's Presidents, Dr. Nibedita Ray-Bennett and Dr. Hideyuki Shiroshita and moderated by ADN Advisor, Mr. Steve Glovinsky.

**Figure 4: Opening of the Brainstorming Workshop**



The Brainstorming Workshop focussed on the nitty-gritty of the context-specific **KEN** platform by exploring:

1. “Who are we?” (the focus)
2. “What issues do we talk about?” (the scope)
3. “Who are the members?” (membership)
4. “Who are the leaders?” (leadership)

Interactive and brainstorming discussions were conducted with the participants to answer these questions. The expert presentations on day two also allowed us to gather further information on these four questions. The findings of these questions are provided below in the form of a leaflet.

## The Indian Community for Avoidable Snakebite Deaths

### Focus (Who We Are)

The Indian Community for Avoidable Snakebite Deaths connects the key actors engaged in and supporting India's effort to reduce deaths due to snakebites in India.

It leverages the power of community to support the goal of the National Programme for Prevention and Control of Snakebite Envenoming in India to reduce snakebite deaths by half by 2030, and the first two global targets of the Sendai Framework to reduce mortality due to disasters.

### Scope (What We Talk About)

The Community addresses the full range of relevant issues related to avoidable snakebite deaths, including:

- **Snakebite prevention** – awareness; education; strategies; snake knowledge (habitats; behaviours; typologies; distribution)
- **Snakebite treatment** – first aid; emergency management; medical professionals/health care providers diagnostic and clinical skills; medical protocols; communication channels and access to treatment centres
- **Antivenom** – production; quality; access; costs; research
- **Resource availability** – funding; skilled professionals; infrastructure; equipment
- **Performance** – data; metrics; monitoring; studies
- **Governance** – policies; regulations; guidelines; programmes; administration
- **Advocacy** – promotional campaigns; strategies; activism

### Membership (Who Should Join)

You should join this Community if you deal with or are interested in issues relating to snakebite prevention, risk governance and timely intervention, and care as a professional, volunteer or local community member, are in India or elsewhere, and you work in

- the health care system
- antivenom production (including venom collection), distribution or research
- communications and public advocacy; the media
- emergency services
- academia or a policy thinktank
- snake-related scientific fields (herpetology; forestry; agriculture; ecology etc.)
- a community based organisation (CBO), a traditional role (healer; faith-based role etc.); sociology/ anthropology
- a Panchayat, District, State or central government office or legislative body
- a non-governmental organisation, international non-governmental organisation, multi- or bilateral organisation, or philanthropic organisation
- the business community.

## The Indian Community for Avoidable Snakebite Deaths (continued)

### Leadership (Who Guides the Community)

The Community is convened by ADN and state-level stakeholder/s, convenor, and co-convenor [to be determined] and guided by an Advisory Group of key actors in this field representing the different perspectives on avoidable snakebite deaths.

### What Participation Entails

Members of this Community interact primarily through an online and face-to-face network to **share** information, **consult** on challenges faced, **collaborate** on group assignments, and **engage** target audiences through team-based interventions. They participate in their personal capacities as professionals. For more information and to sign up, visit [to be determined]

Figure 5: Ceremonial Photo



## Two-Day Symposium: Experts' Presentations

The second day of the Two-Day Symposium consisted of Experts' Presentations at Hotel Suryansh on 21 June 2023 from 10:00 to 16:20. The Experts' Presentations event was attended by 128 participants in person and with 112 views on the YouTube livestream. The in-person participants were identified via stakeholder mapping and were invited by Dr. Nibedita Ray-Bennett (Principal Investigator, Avoidable Snakebite Deaths Project). The remaining 50% were based in Bhubaneswar and were invited by Mr. Dillip Pattanaik (Lead, ADN India Hub). The participants included speakers (20%), Odisha-based snakebite community (20%), civil society organisations (15%), post-graduate students in Rural Development (20%), All India Institute of Medical Sciences post-graduate interns (5%), and members of the ADN India Hub (20%).

The Experts' Presentations featured 15 expert speakers who were a new set of participants (except for one participant) and were purposively invited to gather additional perspectives on the issue of snakebite reduction. The speakers were selected based on the six emergent categories of stakeholders (Key Finding - see **Figure 3: Categories of Stakeholders**), the expert speakers were put under three broad categories of stakeholders: risk reduction experts; technical experts; non-technical experts.

The presentations of the expert speakers focused on four questions which were given to the speakers in their invitation letter:

1. What in your view could be done to reduce the number of snakebite deaths in India?
2. What are the issues facing your own occupation that constrain your ability to reduce the number of snakebite deaths?
3. What do you think would be gained through increased communication and coordination between the persons in your occupation and with the persons in the other occupations engaged in snakebite mitigation?
4. If a virtual network were set up connecting all professionals engaged in mitigating snakebite deaths in India, how interested would you be in participating?

The symposium was delivered over six sessions: Session 1: Inaugural Session; Session 2: Pioneering Partnerships to Reduce Avoidable Snakebite Deaths in India; Session 3: Risk Reduction; Session 4: Technical; Session 5: Non-Technical<sup>4</sup>; and Session 6: Closing.

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<sup>4</sup> The non-technical expert did not attend due to external circumstances. Therefore, Session 5 was cancelled.

## Session 1: Inaugural Session

The Experts' Presentations event was inaugurated by Dr. Ambika Prasad Nanda (Advisor, ADN), Dr. Nibedita Ray-Bennett and Dr. Hideyuki Shiroshita (Presidents, ADN), Mr. Pritiranjana Gharai (Honourable Minister of Rural Development, Skill Development and Technical Education, Odisha), Dr. Omesh Bharti (Himachal Pradesh State Institute of Health and Family Welfare), Dr. Matthew Lewin (Ophirex, Inc.) and Mr. Rom Whitaker (Madras Crocodile Bank Trust and Centre for Herpetology). The session was chaired by Dr. Ambika Prasad Nanda.



**Figure 6: Inaugural Session with the Honourable State Minister, Mr. Pritiranjana Gharai, Dr. Ambika Prasad Nanda and Dr. Nibedita Ray-Bennett**

*Highlights from these speakers are:*

- Interdisciplinary efforts must be taken by herpetologists, zoologists, epidemiologists, forest department, ayurveda department, health department, disaster management department etc., to identify local snake species, *anti-snake venom* efficacy and alternate transport and treatment strategies to mitigate snakebite and lessen the consequent deaths and disabilities.
- The best way to prevent snake bites is to improve education in population groups living in high-risk areas, reduce over-encroachment of natural snake habitats, and improve and increase anti-venom production in the country.
- Safe, inexpensive, easy-to-administer and accessible antidote/ treatment must be made available for snakebite victims.
- Despite the efficacy of snakebite treatment and the amount of funding invested into venom and anti-venom research, it is still not reaching at-risk populations.
- Recently, the National Health Mission has funded snakebite mitigation activities in India, including meetings and training.

## **Session 2: Pioneering Partnerships to Reduce Avoidable Snakebite Deaths in India**

The second session was delivered by Dr. Hideyuki Shiroshita and Dr. Nibedita Ray-Bennett (ADN Presidents), Dr. Stephen Samuel (Avoidable Snakebite Deaths Project Champion), and Mr. Steve Glovinsky (ADN Advisor). The session was chaired by Dr. Ambika Prasad Nanda.

*Highlights from these speakers are:*

- A novel toxin-specific oral antidote may have the potential to save the lives of more snakebite victims.
- Snakebites are avoidable deaths and these deaths can be avoided through preventable, timely and risk governance measures.
- **KEN** has the potential to bring real people with knowledge, experience, and resources together to reduce avoidable snakebite deaths.
- **KEN** is an innovative approach to solving wicked problems such as snakebites that crosscut different sectors, stakeholders, and disciplines.

## **Session 3: Risk Reduction**

Under the ambit of risk reduction, three sub-categories of experts were invited: local community responders, public awareness, and emergency services. In total 10 people spoke in Session One. This included five members of the at-risk community from the village of Burujhari, Ganjam district, Odisha, namely: Mr. Nabaghan Jena, Mr. Maheswar Barada, Mrs. Bilas Jena, Mrs. Susmita Patra, and Mrs. Reena Nayak. Other speakers included: Mr. Viki Gupta (People for Animals), Mr. Gnaneswar Ch (Madras Crocodile Bank Trust and Centre for Herpetology), and Dr. G.V. Ramana Rao (EMRI Green Health Services). The session was chaired by Dr. Ambika Prasad Nanda.

*Highlights from these speakers are:*

- The people of Burujhari do not have access to anti-venoms in their primary health care facilities.
- One speaker was bitten three times by a snake and on all three occasions she sought help from the traditional healer.
- Public awareness is vital to reduce snakebite deaths.
- Traditional treatment for snakebites should be discouraged and the focus should be shifted to *anti-snake venom* use amongst the community.
- A major barrier is a significant delay in calling the ambulance. Victims call the ambulance after about 47 minutes. Then the ambulance takes an average of two hours to reach the victim. This delay needs to be overcome by changing human behaviour through education and awareness and increasing ambulance services in areas prone to snakebite risk.

**Figure 7: Experts' Presentations Participants**



### **Session 3: Technical**

Under the ambit of technical experts, three sub-categories were introduced viz., space, health care and anti-venom experts. In total, five speakers spoke in this session. This included: Professor Kevin Tansey (Institute for Environmental Science, University of Leicester), Dr. Jaideep Menon (Amrita Institute of Medical Sciences and Research Centre), Dr. Nishant Saxena (Indian Council of Medical Research – National Institute of Research in Tribal Health), Dr. Milind Khadilkar (Premium Serums), and Dr. Surajit Giri (Demow Rural Community Health Centre). The session was chaired by Dr. Amarendra Mohapatra and Dr. Stephen Samuel.

*Highlights from these speakers are:*

- Geospatial information collected through technological advancements such as use of *Laser Scanner Technology* to look at trees, surface structure changes and use of satellites and drones to identify such environments through high-resolution images can help locate the species of snakes in an area and mitigate snakebites.
- There needs to be alternate systems of medicine, in-patient services in the primary health centres, a ratified treatment guideline/ protocol, and better training for doctors in medical schools about Snakebite Envenoming.
- Health communication and education are key. Networking “could certainly help to reduce the response time”.
- Ensure medical centres are stocked to the maximum with *anti-snake venom*; ensure the development of *anti-snake venom* is especially



happening/monitored during peak seasons and encourage the use of *anti-snake venoms* by well-trained staff.

- A network model established at a community health centre that includes a non-breakable chain from community to hospital connecting the *Venom Response Team*, *Fast Response Team* and snakebite room were found to be effective for treating snakebite victims.
- Inclusion of traditional tribal healers in the delivery of primary healthcare to snakebite victims in tribal villages (which are low-resource settings and lack emergency response systems) can reduce snakebite deaths.

#### **Session 4: Concluding Remark**

This session was delivered by Mr. Mihir Bhatt (All India Disaster Mitigation Institute). The session chair was Dr. Ambika Prasad Nanda.

*Highlights of this session are:*

- Efforts to reduce snakebite deaths should be widescale.
- There is a need to invest in gaps identified by the speakers by harmonising various existing initiatives through which snakebite deaths can be mitigated.
- Snakebite occurrences in any natural disaster – cyclone, flood or heatwave, also need to be paid attention and mitigated.
- Snakebites during a disaster situation are a matter of double trauma. How do we deal with two traumas? This overlap of two traumas will likely increase due to frequent extreme weather events. Therefore, it is paramount that reduction of avoidable snakebite deaths is prioritised by the national and state governments of India.

## High-Level Round Table Meeting

Following the Two-Day Symposium in Bhubaneswar, a half-day High-Level Round Table Meeting was organised on 23 June 2023 to orientate the key stakeholders about this Avoidable Snakebite Deaths project in New Delhi – the capital city of India. The event was organised by Climate Resilient Observing Systems Promotion Council and welcomed 28 participants.

The orientation was divided into four sessions. The first and inaugural session included five-minute elevator presentations from Dr. Nibedita Ray-Bennett and Dr. Hideyuki Shiroshita, ADN Presidents; Dr. Manas Pratim Roy, Additional Director General of Directorate General of Health Services, Ministry of Health; Dr. Ajit Shewale, Deputy Director of National Centre for Disease Control; Lieutenant General Syed Husnain, Member of National Disaster Management Authority; and Dr. Sunita Reddy, Special Centre for Disaster Research of Jawaharlal Nehru University.

The second session focused on the problem of snakebite deaths in India and solutions to overcome them through ADN's **KEN** model. The session speakers included Dr. Stephen Samuel (Ophirex, Inc.); Mr. Gnaneswar Ch. (Madras Crocodile Bank Trust and Centre for Herpetology); and Mr. Steve Glovinsky (PeerConnect).

The third session focussed on the knowledge-practice gaps in reducing snakebite deaths in India. The session speakers included Dr. Tej Prakash Sinha, Emergency Management, All India Institute of Management Studies, New Delhi; Mr. Anup Kumar Srivastava, Senior Consultant, National Disaster Management Authority; and Mr. Peeyush Sekhsaria, public awareness expert. The fourth session was an open discussion session for the participants.

*Highlights of this high-level round table meeting are:*

- Armed forces on duty are high-risk groups to snakebites.
- To reduce snakebite deaths, it is important to strengthen the primary health centre with anti-venom, as well as establish primary health care facilities where they are lacking.
- To reduce snakebite deaths, it is important that ambulance service is available in each village in Odisha.
- Networking for avoidable snakebite deaths can be promoted through social events, religious festivals, working with local non-governmental organisations, block-level stakeholders, tapping on social movements (e.g., Better Health campaign)
- It is important to develop a hospital plan for the management of snakebites and deaths.
- It is important to promote structural mitigation measures in rural areas to make houses resilient to snakes.

- Dalits and Adivasis are high-risk groups of snakebite deaths because they live in forests and still do non-mechanised farming. These practices increase their exposure to snakebite risk. Avoidable snakebite deaths of high-risk groups need to be prioritised.

**Figure 8: Ceremonial Photo**



## Conclusions

Through the Two-Day Symposium in Bhubaneswar and High-Level Round Table Meeting in New Delhi, we engaged with stakeholders from the national-, state-, district-, sub-district- and village- levels who were mapped using our novel Mapping Tools A and B.

Our seven-month feasibility study, for a pioneering **KEN** to reduce avoidable snakebite deaths, engaged with more than 100 stakeholders who agreed that there is a need for a **KEN** which should be piloted in Odisha, where the project was conceived by the [ADN India Hub](#).

Based on the highlights of these events, a few recommendations are furnished below for the Honourable State Minister of Rural Development, Skill Development and Technical Education, Mr. Pritiranjana Gharai.

Findings of the focus group discussions and interviews at village levels will be disseminated through a research brief and a peer reviewed publication.

## Recommendations

- 1) Snakebite and associated deaths are largely a rural phenomenon in India and Odisha is no exception. Most snakebite deaths take place during the monsoon season and the high-risk groups are: Adivasi and Dalit farmers, children, women, and herders (among others). Snakebite deaths are a wicked problem. To reduce snakebite deaths, our research activities clearly indicated that it is a cross-cutting issue for many Departments.

As such, we recommend that KEN be piloted in Odisha with the Rural Development Department in collaboration with nine important Departments (although not limited to) viz: i) Odisha State Disaster Management Authority; ii) Revenue and Disaster Management Department; iii) Odisha-India Meteorological Department; iv) Forest, Environment and Climate Change Department; v) Department of Health and Family Welfare; vi) ST and SC Development, Minorities and Backward Classes Welfare Department; vii) Department of Housing and Urban Development; viii) Department of Agriculture and Farmers' Empowerment; ix) Department of School and Mass Education.

- 2) We recommend that the relevant Department/s of the Government of Odisha sponsor Avoidable Deaths Network (ADN) to pilot a 'snakebite forecast system for the monsoon season'. The snakebite forecast can be disseminated through daily news after the weather forecast. This snakebite forecast system will be piloted in collaboration with the University of Leicester's Institute for Environmental Futures where the Avoidable Deaths Network-UK is based.
- 3) We recommend that the relevant Department of the Government of Odisha sponsors the Avoidable Deaths Network to pilot a small-scale study to create a database of avoidable snakebite deaths under three categories: preventable snakebite death, amenable snakebite death, and governance-related snakebite death. Category-specific avoidable deaths data can guide context-specific and tailored category-intervention/s and optimise finite resources to reduce avoidable snakebite deaths during the monsoon season.
- 4) We recommend that the relevant Department of the Government of Odisha sponsors Avoidable Deaths Network to raise awareness of avoidable snakebite deaths through mass education, curriculum innovation for state schools, colleges, and universities, and periodic continuing medical education (CME) and workshops for interns in the healthcare field; and change in sleeping behaviour for high-risk groups during the monsoon season through information, education and communication (IEC) materials and grassroots advocacy.

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## Annexes

The Avoidable Snakebite Deaths Project is led by Dr Nibedita S. Ray-Bennett in collaboration with 14 collaborating organisations: University of Leicester, PeerConnect, Disaster Management Advice and Training Consulting KG, Kansai University, Sheffield University, All India Institute of Disaster Management, Orissa State Volunteers Social Worker's Association, Tata Steel, Kalahandi University, Doers, Zoological Survey of India, Indian Council of Medical Research, Indian Council of Medical Research - National Institute of Research in Tribal Health, Demow Rural Community Health Centre, Snake Helpline and All India Institute of Medical Science.

Additionally 11 gatekeepers (Champions/ Convenors) were gained during the project, including nine institutions Ophirex, Inc., Climate Resilient Observing-Systems Promotion Council, Amrita Institute of Medical Sciences and Research Centre, Premium Serums, Madras Crocodile Bank Trust and Centre for Herpetology, Himachal Pradesh State Institute of Health and Family Welfare, EMRI Green Health Services, and Bongaigaon Civil Hospital and two independent snake rescuers.

### Annex 1: Two-Day Symposium - Agenda

#### Brainstorming Workshop

**Date:** 20 June 2023, Tuesday

**Venue:** Hotel New Marion, Bhubaneswar, Odisha, India

#### 10:00 – 11:00 | Part 1: Opening

1. [Welcome & Setting the Agenda for the Day](#) - Dr. Ambika Prasad Nanda, Tata Steel
2. [Guest of Honour](#) - Professor Dr. Santosh Kumar Tripathy, Fakir Mohan University
3. [Context: The Community Model and the Roadmap to Establish It](#) - Mr. Steve Glovinsky, PeerConnect

#### 11:00 – 11:45 | Part 2: Check In

1. [Reflections on Consultations](#) - Dr. Nibedita Ray-Bennett, University of Leicester
2. [Update on Fieldwork](#) – Ms. Basanti Sarangi, Orissa State Volunteers and Social Workers Association

#### 12:00 – 13:50 | Part 3: The Community Leaflet

Moderator: Mr. Steve Glovinsky

1. [“Who are we?” \(the focus\)](#) - Group Discussion

2. "What issues do we talk about?" (the scope) - Group Discussion
3. "Who are the members?" (membership) - Group Discussion
4. "Who are the leaders?" (leadership) - Group Discussion

#### **14:50 – 15:50 | Part 4: The Roadmap**

Moderator: Mr. Steve Glovinsky

1. Key Steps - Group Discussion
2. Timetable - Group Discussion
3. Resources - Group Discussion
4. Financing - Group Discussion

#### **15:50 – 16:30 | Part 5: Closing**

1. Experts Presentations (Day 2) - Mr. Steve Glovinsky, PeerConnect
2. Way Forward - Dr. Nibedita Ray-Bennett, University of Leicester
3. Close - Mr. Dillip Pattanaik, Orissa State Volunteers and Social Workers Association

#### **16:30 – 17:00 | Networking**

### **Experts' Presentations**

**Date:** 21 June 2023, Wednesday

**Venue:** Hotel Suryansh, Bhubaneswar, Odisha, India

**YouTube Link:** <https://youtube.com/live/Lu8lUEVISsA>

#### **10:00 – 10:55 | Part 1: Inaugural Session**

Chairs: Mr. Dillip Pattanaik and Dr. Ambika Prasad Nanda

1. Welcome from the Avoidable Deaths Network - Dr. Ambika Prasad Nanda, Tata Steel; Dr. Nibedita Ray-Bennett, University of Leicester; Dr. Hideyuki Shiroshita, Kansai University
2. Government of Odisha - Mr. Pritiranjana Gharai, Honourable Minister of Rural Development, Skill Development and Technical Education; Mr. Sudam Marandi, Honourable Minister of School and Mass Education
3. Odisha State Disaster Management Authority - Dr. Gyana Ranjan Das, Odisha State Disaster Management Authority
4. National Health Mission - Dr. Omesh Bharti, State Institute of Health and Family Welfare

5. [Indian Council of Medical Research](#) - Dr. Sanghamitra Pati, Indian Council of Medical Research

6. [Perspectives of New and Add-On Therapies for Snakebite](#) - Dr. Matthew Lewin, Ophirex, Inc.

7. [Madras Crocodile Bank Trust](#) - Mr. Rom Whitaker, Madras Crocodile Bank Trust

#### **10:55 – 11:15 | Ceremonial Photo**

#### **11:15 – 11:55 | Part 2: Pioneering Partnerships To Reduce Avoidable Snakebite Deaths In India**

Chairs: Mr. Dillip Pattanaik and Dr. Ambika Prasad Nanda

1. [Avoidable Deaths Network](#) - Dr. Hideyuki Shiroshita, Kansai University

2. [Problems of Snakebites in India](#) – Dr. Nibedita Ray-Bennett, University of Leicester; Dr. Stephen Samuel, Ophirex, Inc.

3. [Consultation Results](#) – Mr. Steve Glovinsky, PeerConnect

#### **12:05 – 13:15 | Part 3: Risk Reduction**

Chairs: Dr. Nibedita Ray-Bennett and Dr. Amarendra Mohapatra

1. [Local Community Responders](#) - Local At-Risk Community, Ganjam and Puri, Odisha

2. [Public Awareness](#) - Mr. Viki Gupta, People for Animals; Mr. Gnaneswar Ch, Madras Crocodile Bank Trust

3. [Emergency Services](#) - Dr. G.V. Ramana Rao, EMRI Green Health Services

#### **14:15 – 15:25 | Part 4: Technical**

Chair: Dr. Stephen Samuel

1. [Scoping for Space Science in Avoidable Snakebite Deaths](#) - Professor Kevin Tansey, University of Leicester

2. [Health Care](#) - Dr. Sudipta Ranjan Singh, All India Institute of Medical Sciences; Dr. Jaideep Menon, Amrita Institute of Medical Sciences and Research Centre; Dr. Nishant Saxena, Indian Council of Medical Research – National Institute of Research in Tribal Health

3. [Anti-Venom](#) - Dr. Milind Khadilkar, Premium Serums; Dr. Surajit Giri, Demow Rural Community Health Centre

#### **15:45 – 16:00 | Part 5: Non-Technical**

Chair: Dr. Stephen Samuel

1. [Snake Profiling](#) - Mr. Subhendu Mallik, Snake Helpline

**16:00 – 16:20 | Part 6: Closing**

Chair: Mr. Dillip Pattanaik

1. **Concluding Remark** - Col. Sanjay Srivastava, Climate Resilient Observing Systems Promotion Council; Mr. Mihir Bhatt, All India Disaster Mitigation Institute

## Annex 2: High-Level Round Table Meeting – Agenda

**Date:** 21 June 2023, Wednesday

**Venue:** India Habitat Centre, New Delhi, India

### 10:00 – 10:55 | Part 1: Inaugural Session

Chairs: Col. Sanjay Srivastava and Dr. Nibedita Ray-Bennett

1. [Climate Resilient Observing Systems Promotion Council](#) – Col. Sanjay Srivastava
2. [University of Leicester](#) - Dr. Nibedita Ray-Bennett
3. [Kansai University](#) - Dr. Hideyuki Shiroshita
4. [Ministry of Health and Family Welfare](#) - Dr. Manas Pratim Roy, Directorate General of Health Services
5. [National Centre for Disease Control](#) - Dr. Ajit Shewale
6. [National Disaster Management Authority](#) - Lieutenant General Syed Husnain
7. [Jawaharlal Nehru University](#) - Professor Sunita Reddy, Special Centre for Disaster Research

### 10:55 – 11:00 | Ceremonial Photo

### 11:00 – 11:20 | Networking

### 11:20 – 12:10 | Part 2: Pioneering Partnership to Reduce Avoidable Deaths

Chairs: Dr. KJ Ramesh and Col. Sanjay Srivastava

1. [Kansai University](#) - Dr. Hideyuki Shiroshita
2. [Ophirex, Inc.](#) - Dr. Stephen Samuel
3. [Madras Crocodile Bank Trust](#) – Mr. Gnaneswar Ch
4. [University of Leicester](#) - Dr. Nibedita Ray-Bennett
5. [PeerConnect](#) – Mr. Steve Glovinsky

### 12:15 – 12:55 | Part 3: Knowledge and Partnership for Risk Reduction

Chairs: Dr. Tej Prakash Sinha and Dr. Nibedita Ray-Bennett

1. [All India Institute of Medical Sciences](#) - Dr. Tej Prakash Sinha, Emergency Management
2. [Indian Council of Medical Research](#) - Dr. Joy Kumar Chakma
3. [National Disaster Management Authority](#) – Mr. Anup Kumar Srivastava
4. [Snakebite Expert](#) - Mr. Peeyush Sekhsaria

**13:05 – 13:25 | Part 4: Open Discussion**

Moderator: Col. Sanjay Srivastava

**13:25 – 13:35 | Part 5: Closing**

1. Climate Resilient Observing Systems Promotion Council – Col. Sanjay Srivastava

**13:35 – 15:00 | Networking**

## Annex 3: Two-Day Symposium - List of Presenters and Chairs

### Brainstorming Workshop

#### Presenters' Profiles

**Dr. Ambika Prasad Nanda** – Head, Corporate Social Responsibility, Tata Steel, Odisha.

**Professor Santosh Kumar Tripathy** – Vice Chancellor, Fakir Mohan University, Odisha.

**Dr. Nibedita S. Ray-Bennett** – Associate Professor, Risk Management, School of Business; Programme Director, MSc in Risk, Crises and Disaster Management, School of Business; and Leader, Research Challenge, Climate Risk and Disaster Risk Reduction, Institute for Environmental Futures, University of Leicester. Founding President and Convenor, Avoidable Deaths Network.

**Ms. Basanti Sarangi** – Project Officer, Orissa State Volunteers and Social Workers Association, Odisha.

**Mr. Dillip Pattanaik** – Executive Director, Orissa State Volunteers and Social Workers Association, Odisha; Vice President, Women in Science and Engineering India; and Member, Board of Directors, International Network of Women Engineers and Scientists - Education and Research Institute.

#### Moderator's Profile

**Mr. Steve Glovinsky** – Founder, PeerConnect, New York, USA; and Advisor, Avoidable Deaths Network.

### Experts' Presentations

#### Presenters' Profiles

**Mr. Pritiranjana Gharai** - Honourable Minister of Rural Development, Skill Development and Technical Education, Odisha; Member, Odisha Legislative Assembly, Sukinda; and Member, Standing Committee on Revenue and Disaster Management.

**Mr. Sudam Marandi<sup>5</sup>** - Honourable Minister of School and Mass Education, Odisha. Member, Odisha Legislative Assembly.

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<sup>5</sup> Six speakers agreed to participate but were unable to attend due to mitigating circumstances.

**Dr. Gyana Ranjan Das<sup>3</sup>** - Managing Director, Odisha State Disaster Management Authority.

**Dr. Omesh Bharti** - State Epidemiologist, State Institute of Health and Family Welfare, Himachal Pradesh. Expert, Panel, Implementing the World Health Organisation Strategic Plan to Control and Prevent Snakebite Envenoming.

**Dr. Sanghamitra Pati<sup>3</sup>** – Director, Regional Medical Research Centre, Indian Council of Medical Research, Bhubaneswar, Odisha.

**Dr. Matthew Lewin** – Co-Founder and Chief Scientific Officer, Ophirex, Inc., CA, USA; Elected Fellow, California Academy of Sciences; Fellow, American College of Emergency Physicians; National Fellow, Explorers Club; and Member, Board of the North American Society of Toxinology.

**Mr. Rom Whitaker** – Herpetologist. Founder, Madras Crocodile Bank Trust and Centre for Herpetology, Tamil Nadu.

**Mr. Steve Glovinsky** – Founder, PeerConnect, New York, USA; and Advisor, Avoidable Deaths Network.

**Local At-Risk Community** – Mr. Nabaghan Jena, Ms. Bilas Jena, Mr. Maheswar Barada, Ms. Susmita Patra and Ms. Reena Nayak, Ganjam and Puri, Odisha

**Mr. Viki Gupta** – People for Animals, Odisha.

**Mr. Ganeswar Ch** – Project Coordinator, Madras Crocodile Bank Trust, Tamil Nadu.

**Dr. G.V. Ramana Rao** – Director, Emergency Medicine Learning Centre and Research, EMRI Green Health Services, Telangana.

**Professor Kevin Tansey** – Professor of Remote Sensing, Institute for Environmental Futures, University of Leicester, England

**Dr. Sudipta Ranjan Singh<sup>3</sup>** – Additional Professor, Forensic Medicine & Toxicology, All India Institute of Medical Sciences, Odisha.

**Dr. Jaideep Menon** – Professor, Cardiology, Amrita Institute of Medical Sciences and Research Centre, Kerala.

**Dr. Nishant Saxena** - Scientist C, Anthropology and Social Behavioural Sciences, Indian Council of Medical Research – National Institute of Research in Tribal Health, Madhya Pradesh.

**Dr. Milind Khadilkar** – Founder, Premium Serums, Maharashtra.

**Dr. Surajit Giri** - Consultant Anaesthesiologist, Demow Rural Community, Health Centre, Assam.

**Mr. Subhendu Mallik<sup>3</sup>** – General Secretary, Snake Helpline, Odisha.



**Col. Sanjay Srivastava<sup>3</sup>** - Chairman, Climate Resilient Observing Systems Promotion Council, Delhi.

**Mr. Mihir Bhatt** – Director, All India Disaster Mitigation Institute, Gujarat.

### **Chairs' Profiles**

**Dr. Nibedita S. Ray-Bennett** – Associate Professor, Risk Management, School of Business; Programme Director, MSc in Risk, Crises and Disaster Management, School of Business; and Leader, Research Challenge, Climate Risk and Disaster Risk Reduction, Institute for Environmental Futures, University of Leicester. Founding President and Convenor, Avoidable Deaths Network.

**Dr. Hideyuki Shiroshta** – Associate Professor, Disaster Mitigation and Safety Education, Graduate School and Faculty of Societal Safety Sciences, Kansai University; Founding President of Avoidable Deaths Network; and Chairperson, Osaka Prefectural Committee for Promoting Safety and Disaster Education.

**Dr. Stephen Samuel** – Vice President, Clinical Affairs, Ophirex, Inc., CA, USA; and Visiting Physician Scientist, TCR Multispecialty Hospital, Krishnagiri, Tamil Nadu.

**Dr. Amarendra Mohapatra** – Head Epidemiologist, Regional Medical Research Centre, Indian Council of Medical Research, Bhubaneswar, Odisha.

**Dr. Ambika Prasad Nanda** – Head, Corporate Social Responsibility, Tata Steel, Odisha.

**Mr. Dillip Pattanaik** – Executive Director, Orissa State Volunteers and Social Workers Association, Odisha; Vice President, Women in Science and Engineering India; and Member, Board of Directors, International Network of Women Engineers and Scientists - Education and Research Institute.

## **Annex 4: High-Level Round Table Meeting - List of Presenters and Chairs**

**Dr. Manas Pratim Roy** – Additional Director General, Directorate General of Health Services, Ministry of Health and Family Welfare, Delhi.

**Dr. Ajit Shewale** – Deputy Director, National Centre for Disease Control, Delhi.

**Lieutenant General Syed Husnain** – Member, National Disaster Management Authority, Delhi.

**Professor Sunita Reddy** – Assistant Professor, Special Centre for Disaster Research, Jawaharlal Nehru University, Delhi.

**Mr. Steve Glovinsky** – Founder, PeerConnect, New York, USA; and Advisor, Avoidable Deaths Network.

**Mr. Gnaneswar Ch** – Project Coordinator, Madras Crocodile Bank Trust, Tamil Nadu.

**Dr. Joy Kumar Chakma** – Scientist E, Indian Council of Medical Research, Delhi.

**Mr. Anup Kumar Srivastava** – Senior Consultant, National Disaster Management Authority, Delhi.

**Mr. Peeyush Sekhsaria** – Expert on Snakebite.

**Dr. Hideyuki Shiroshita** – Associate Professor, Disaster Mitigation and Safety Education, Graduate School and Faculty of Societal Safety Sciences, Kansai University; Founding President of Avoidable Deaths Network; and Chairperson, Osaka Prefectural Committee for Promoting Safety and Disaster Education, Japan.

**Dr. Stephen Samuel** – Vice President, Clinical Affairs, Ophirex, Inc., CA, USA; and Visiting Physician, TCR Multispecialty Hospital, Krishnagiri, Tamil Nadu.

### **Chairs' Profiles**

**Col. Sanjay Srivastava<sup>3</sup>** - Chairman, Climate Resilient Observing Systems Promotion Council; Professor of Practice, TERI SAS University, Delhi.

**Dr. Nibedita S. Ray-Bennett** – Associate Professor, Risk Management, School of Business; Programme Director, MSc in Risk, Crises and Disaster Management, School of Business; and Leader, Research Challenge, Climate Risk and Disaster Risk Reduction, Institute for Environmental Futures, University of Leicester. Founding President and Convenor, Avoidable Deaths Network.

**Dr. Tej Prakash Sinha** – Professor, Emergency Management, All India Institute of Medical Sciences, Delhi.

**Dr. KJ Ramesh** – Former Director General, India Meteorological Department, New Delhi.