ENHANCING SAFETY, PREPAREDNESS AND CAPACITY IN INDIA'S OIL AND GAS SECTOR

Training Report

Capacity Building Program on Emergency Response and Disaster Management Plan (ERDMP)

A Joint Initiative of Petroleum and Natural Gas Regulatory Board (PNBRG) and Gujarat Institute of Disaster Management (GIDM), Government of Gujarat

11-13 November 2025

BACKGROUND

A three-day **Capacity Building Program on Emergency Response and Disaster Management Plan (ERDMP)** was jointly organized by the **Petroleum and Natural Gas Regulatory Board (PNGRB) and the Gujarat Institute of Disaster Management (GIDM)** from 11th to 13th November 2025 at the GIDM Campus, Gandhinagar. The program was conducted under the ongoing **Memorandum of Understanding (MoU) between PNGRB and GIDM,** aimed at promoting a culture of **safety, preparedness and resilience** across India's oil and gas value chain.

This initiative formed part of a broader national effort to strengthen institutional and technical capacities for **emergency response and disaster risk management** within the energy sector. Considering the growing complexity and scale of oil and gas infrastructure, the program emphasized the need for **systematic emergency planning**, **inter-agency coordination** and **strict adherence to PNGRB's ERDMP Regulations, 2010**, to ensure effective preparedness and response mechanisms.

A total of **31 participants**, representing a diverse range of organizations including **public sector undertakings (PSUs), refineries, oil and gas companies, city gas distribution networks and safety and environmental departments,** took part in the training. Through **expert-led sessions, case studies and table-top exercises**, the participants enhanced their understanding of **risk assessment, hazard identification, emergency response mechanisms and resilience-building measures.** The program provided a comprehensive platform for **knowledge sharing, practical learning**, **and alignment with both national safety regulations and international good practices** in disaster management for the oil and gas sector.

The detailed program note and the list of participants are enclosed as **Annexure 1** and **Annexure 2**, respectively.

WELCOME ADDRESS

The inaugural session of the three-day **Capacity Building Program on Emergency Response and Disaster Management Plan (ERDMP)** began with a warm welcome by the **Gujarat Institute of Disaster Management (GIDM)** team on **11th November 2025** at the GIDM Campus, Gandhinagar. Representatives from GIDM extended greetings to all dignitaries, expert speakers and participants, outlining the objectives of the program and emphasizing its importance in strengthening disaster preparedness and emergency response capacities in the oil and gas sector. Participants were encouraged to make the most of the interactive sessions and share their professional experiences to enrich collective learning.

Following this, **Mr. Jayanta Narayan Das, Member, Petroleum and Natural Gas Regulatory Board (PNGRB)**, addressed the gathering and delivered the **welcome address** virtually. In his remarks, Mr. Das extended his warm greetings to all participants and highlighted the significance of this joint initiative under the MoU between PNGRB and GIDM. He noted that India's rapidly expanding oil and gas infrastructure brings both immense growth potential and heightened safety challenges, underscoring the critical importance of structured preparedness, trained manpower, and coordinated response mechanisms.

Mr. Das elaborated on the role of **PNGRB's ERDMP Regulations, 2010**, describing them as a vital framework for ensuring safety, resilience, and sustainability across petroleum and natural gas operations. He emphasized that ERDMP should be viewed not merely as a compliance document but as a dynamic and evolving mechanism to safeguard lives, protect assets, and ensure business continuity. Encouraging active participation, he urged all attendees to engage in discussions, share field experiences, and apply the lessons learned to strengthen safety culture and emergency readiness within their respective organizations.

SESSION PROCEEDINGS AND KEY HIGHLIGHTS

Session 1: Understanding Disaster Risk Management and Current Trends

The first technical session of the program was conducted by **Mr. Nisarg Dave, Director (Disaster Management), GIDM**. The session provided a comprehensive overview of the **concepts, frameworks and evolving trends in Disaster Risk Management (DRM)**, with specific reference to their implications for the **oil and gas sector**.

Mr. Dave began by introducing the fundamental concepts of **hazard, vulnerability, exposure, capacity and risk**, explaining how these elements interact to determine disaster impacts. He outlined the **Disaster Management Act, 2005**, its **2025 Amendment**, and the **institutional and operational structures** of disaster management in India. The presentation further explored the **Sendai Framework for Disaster Risk Reduction (2015–2030)** and the **Hon'ble Prime Minister's 10-Point Agenda on DRR**, linking these global and national frameworks to the energy sector's safety and preparedness responsibilities.

Drawing on data from **CRED 2025** and **UNDRR**, the session highlighted global and national disaster trends — including a marked increase in climate-related disasters, extreme rainfall, heatwaves and cyclonic activity in the Arabian Sea and the Indian Ocean region. Mr. Dave discussed how these changing hazard patterns amplify risks for the petroleum and natural gas industry, including **NaTech (Natural Hazards Triggering Technological) accidents** such as pipeline ruptures, fires and chemical leaks.

Through examples like the **Bhadbhut Gas Pipeline Explosion (2013)** and the **Sundarban Oil Spill (2014)**, he illustrated how natural hazards can trigger cascading technological

failures, stressing the need to integrate **climate risk, early warning systems and infrastructure resilience** into ERDMP planning. The session concluded emphasizing that proactive risk reduction and preparedness are the most cost-effective strategies for minimizing industrial disaster impacts.

Session 2: Hazard Identification and Risk Assessment

The second technical session was delivered by **Mr. Manish Dhroov, Vice President – HSE & Artificial Intelligence, Gujarat Gas Limited (GGL)**, focusing on **Hazard Identification, Risk Assessment and Management Practices** within the framework of **PNGRB ERDMP Regulations, 2010 (as amended)**. The session emphasized the systematic process of identifying, assessing and mitigating risks associated with the handling, transportation and distribution of petroleum and natural gas.

Mr. Dhroov began with an overview of the **ERDMP regulatory framework**, its scope and key components such as emergency classification (Level I–III), roles and responsibilities, control centers and mutual aid mechanisms. He explained the classification of emergencies — from **onsite (Level I and II)** to **offsite (Level III)** — and elaborated on the need for regular mock drills, communication protocols and coordination with local authorities to ensure readiness at all levels of response.

The session then delved into the **importance of Material Safety Data Sheets (MSDS)** in providing essential information on chemical and physical properties, safe handling practices, first aid and firefighting measures. Participants were introduced to various hazards across **PNG, CNG and LNG systems**, such as leaks, fires, explosions and cryogenic exposure, as well as occupational risks linked to confined spaces, hot work, lifting operations and excavation activities.

Mr. Dhroov elaborated on the **methods and tools for hazard identification**, including **HAZID, HAZOP, workplace inspections, leak detection surveys, safety tours, audits and Management of Change (MoC)** procedures. He also discussed the significance of **hazard and near-miss reporting systems**, supported by employee recognition programs, to promote proactive safety culture.

Building on hazard identification, the session introduced the **risk management cycle** — identifying, analyzing, assessing, mitigating, and monitoring risks — and the use of both **qualitative and quantitative tools** such as **Risk Registers, QRA (Quantitative Risk Assessment), HAC (Hazardous Area Classification) and EMERA (Escape Muster Evacuation and Rescue Analysis)**. A detailed discussion on the **ALARP (As Low As Reasonably Practicable)** principle guided participants on setting acceptable risk thresholds and documenting continuous improvement measures.

Through case examples and visual illustrations, the session highlighted best practices in risk reduction, covering **elimination, substitution, engineering controls, administrative measures and personal protective equipment (PPE)**. Mr. Dhroov reinforced that hazard identification and risk assessment form the **foundation of ERDMP**, ensuring preparedness for both routine operations and emergency scenarios.

Sessions 3 & 4: Quantitative Risk Assessment and Learning from Real-World Case Studies

The post-lunch sessions of Day 1 were conducted by **Shri Hirak Dutta, Expert Advisor, Petroleum and Natural Gas Regulatory Board (PNGRB)**, and former Executive Director, Oil Industry Safety Directorate (OISD). Shri Dutta adopted a **case study–based approach** to explain the principles and practical applications of **Quantitative Risk Assessment (QRA)** and **Risk Mitigation** in the oil and gas sector.

The sessions aimed to help participants understand how systematic risk identification, analysis, and mitigation form the foundation of an effective **Emergency Response and Disaster Management Plan (ERDMP)**. Participants were introduced to real-world accident scenarios and engaged in interactive discussions on **risk quantification, hazard mapping, and consequence modeling**.


To illustrate the real-world significance of risk assessment and disaster management, Shri Dutta presented detailed **case studies** on major industrial accidents, including the **Styrene Gas Leak at LG Polymers (Visakhapatnam, 2020)**, the **Jaipur IOC Terminal Fire (2009)** and the **Tatipaka Gas Pipeline Leak and Explosion**. Through these analyses, he demonstrated how systematic QRA could have identified critical risks such as **corrosion, leak potential and equipment failure probabilities**, enabling timely preventive actions. He emphasized that QRA serves not only as a compliance tool but also as a **decision-support mechanism**, allowing organizations to quantify risks, prioritize controls, and design effective mitigation strategies.

During the session, Shri Dutta also discussed innovative technological interventions that support real-time decision-making during industrial emergencies. A notable example shared was the **ROCERS (Remote Sensing–Enabled Online Chemical Emergency Response System)** — a Decision Support System established by the **Department of Factories and Boilers, Government of Kerala**, in collaboration with the **National Remote Sensing Centre (NRSC), Hyderabad**, and the **Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam**. ROCERS integrates **satellite imagery, weather modeling, and chemical sensors** to monitor hazardous chemical releases and provide real-time alerts and dispersion forecasts. Initially implemented at the **FACT Ltd. ammonia storage site in Ambalamedu**, the system has since been expanded to include multiple **Major Accident Hazard (MAH)** units in Kerala. Shri Dutta highlighted ROCERS as a forward-looking model for **technology-enabled industrial risk management**, demonstrating how such systems can greatly enhance preparedness, early warning, and emergency response capabilities across the country.

The discussions also covered the **methodology of QRA**, including hazard identification, frequency estimation, consequence modeling and risk ranking. Shri Dutta underscored the need for continuous updating of QRA studies in line with process changes, emphasizing that effective use of QRA can significantly reduce the likelihood and severity of catastrophic events.

Following the case study discussions, **Shri Dutta conducted a hands-on group exercise** to consolidate participants' learning. The participants were divided into **four groups**, each representing different operational segments — **pipelines, terminals, transportation, and city gas distribution networks**. Each group was given a specific incident scenario and tasked to perform a **quantitative risk evaluation**, identifying potential hazards, assessing probabilities and consequences and proposing mitigation measures in line with ERDMP and QRA good practices. The groups later presented their findings, showcasing their analytical approach and practical understanding of risk management. This interactive exercise encouraged peer learning and demonstrated how QRA principles can be effectively applied in real operational settings.

The sessions concluded with a strong message that **quantitative risk assessment, backed by a culture of safety and operational discipline, is central to effective risk management**. Shri Dutta reiterated that risk awareness, regular audits and continuous improvement must be embedded at every level of operation to prevent recurrence of such industrial incidents.

The first day of the training concluded with a series of insightful technical sessions facilitated by subject experts from GIDM**,** PNGRB, and the oil and gas industry. The sessions provided participants with a comprehensive understanding of the **fundamentals of disaster risk management**, **hazard identification** and **quantitative risk assessment (QRA)** within the framework of the **ERDMP Regulations, 2010**. Participants highly appreciated the engaging and application-oriented approach of the sessions, which effectively blended regulatory perspectives with practical case studies and real-world experiences from the sector.

Day 2 of the training program commenced with a technical session on **"International Best Practices in Emergency Management"**, setting the tone for a day focused on global safety standards, learning from experience and leadership in crisis situations. The session was designed to build upon the foundational concepts covered on Day 1 and to help participants understand how advanced practices, innovative technologies, and organizational leadership principles can enhance the implementation of the ERDMP framework.

Sessions 5: International Best Practices in Emergency Management

During the session, **Mr. Vidiyala Ravi** highlighted the need for benchmarking our existing industry practices with various **International Regulations like SEVESO-III, COMAH and OSHA** Process Safety Managment pertaining to Emergency Management for enhancing our safety performance and prevent industrial disasters. The Seveso event led to the EU creating a series of directives (now Seveso III Directive), requiring Member States to identify, regulate, and protect industrial sites posing major accident risks. Mr.Ravi has emphasized the need for **sharing key information on hazardous substances to the nearby community by Industries**. While this will not only improve the compliances to various Indian regulations but also create awareness among the communities.

Mr. Ravi **compared leading regulatory frameworks**: the EU's **Seveso Directives,** the USA's **OSHA Process Safety Management (PSM),** and the UK's **COMAH regulations**. Importance

of implementation of Major Accident Prevention Policy and robust Safety Management Systems would support Industries in Prevention of chemical disasters.

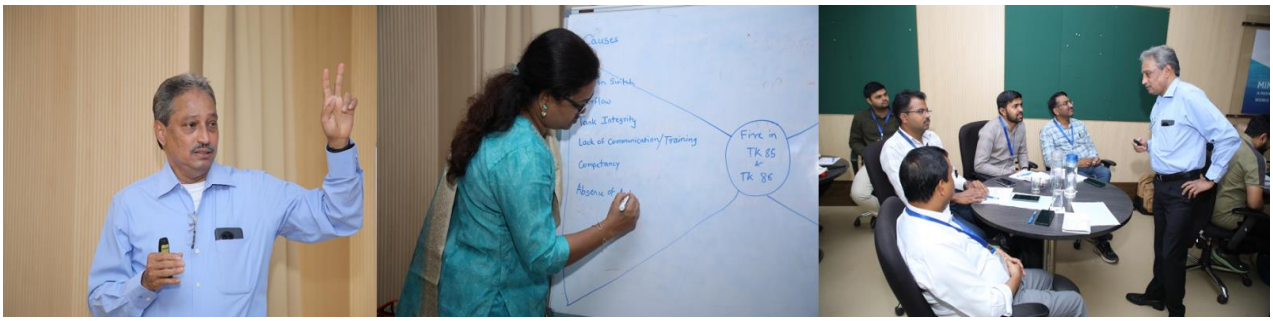
The preparation of a detailed **Pre-Incident Plan** helps industries identify major hazards, establish barriers to prevent incidents, and implement mitigation measures before they materialize. The Pre-Incident Plan also serves as an effective tool to create awareness among first responders and to ensure the efficient handling of emergencies.

The session emphasized the growing role of technology in emergency preparedness. Mr. Ravi shared details about the development of the **Industrial Chemical Emergency Preparedness and Planning Platform** by the **PI Centre of Excellence for Industrial Safety and Risk Management**—a joint initiative between **GIDM** and the **PI Foundation**.

This platform is designed to assist industries, regulators, and district authorities in effective planning and preparedness for chemical emergencies. In his concluding remarks, Mr. Ravi emphasized that every employee should understand what could potentially go wrong in their area of operation that may lead to a major event, and how barriers function to prevent or mitigate such events. He also stressed that maintaining the effectiveness of these barriers is crucial for the prevention of incidents

Session 6: Learning from Near-Miss Reporting

During the session, **Mr. Prakash Dashputre, HSE Expert**, **discussed the critical process of organizational learning from failure signals** by focusing on robust **Near-Miss Reporting**. He began by framing this need through an analysis of **real-world Public Sector Undertaking (PSU) case examples**, specifically using the **Koyali Indian Oil refinery fire that occurred on August 4, 1995**. This significant fire resulted in the **destruction of two massive storage tanks**, causing substantial financial loss for IOCL, production disruption due to safety shutdowns and significant environmental damage from air pollution and contaminated water/soil. Mr. Dashputre emphasized that such major incidents typically lead to a serious review of safety procedures and risk assessments, highlighting how minor incidents, or near-misses, often serve as crucial precursors to major accidents and that capturing these events is key to proactive safety management.



Mr. Dashputre also **detailed advanced methodologies for investigating these incidents**, emphasizing the application of **Root Cause Discussion using Bowtie and Fault Tree methods**. He explained that **Bowtie Analysis** is a risk assessment methodology that visually maps a hazard scenario, showing causes, the event, and its consequences in a bow-tie-shaped diagram. It identifies potential risks on the left (threats), the central "top event" (hazard), and the outcomes on the right (consequences), including "barriers" or controls to prevent causes from leading to the event and to mitigate consequences if the event occurs. He further elaborated on **Fault Tree Analysis (FTA)** as a top-down, deductive method used in safety and reliability engineering to analyze the causes of a specific undesirable event within a system, representing failure pathways using Boolean logic gates like AND and OR. These systematic analytical techniques help trace potential failure pathways, model complex hazards, and identify the fundamental systemic breakdowns that allow hazards to progress into incidents, thereby enabling the design of effective control barriers.

Furthermore, Mr. Dashputre **added that effective learning requires addressing both organizational structure and human factors**. He stressed the importance of fostering a non-punitive culture for **organizational learning from failure signals**, which encourages transparent reporting and facilitates the integration of lessons learned back into the safety management system. Finally, he highlighted the critical **Behavioural (Human) Aspects** of safety, which include **training, risk perception, staffing, control on field activities, observing legal compliances and admin control**. He explained that understanding human error, cognitive biases and workplace culture is essential for designing truly resilient safety systems.

Session 7 & 8: Leading Through Crisis: Tactical Decision-Making in Emergencies

These sessions were conducted by **Dr. Rakesh Dubey, Former Director, Disaster Management Institute (DMI), Bhopal**, on the theme **"Leading Through Crisis: Tactical Decision-Making in Emergencies."** These two consecutive sessions were designed to strengthen participants' leadership, coordination and decision-making abilities during complex emergency situations, aligning closely with the operational and behavioral competencies required under the ERDMP framework.

In the first part of the session, Dr. Dubey provided an in-depth overview of the **principles of crisis leadership** and the dynamics of decision-making under pressure. He highlighted the importance of **situational awareness, clarity of communication and resource prioritization** in emergency environments. The discussion also covered the **Incident Command System (ICS)**, emphasizing the command hierarchy, information flow and coordination among on-site and off-site response teams. Drawing from national and international disaster experiences, Dr. Dubey illustrated how leadership behavior, cognitive bias and stress response influence tactical decisions in real-world emergencies.

The **second part of the session** was conducted as a **hands-on simulation exercise** titled **"Emergency Room Simulation"**, designed to immerse participants in realistic crisis conditions. Participants were divided into teams and assigned different emergency scenarios involving **missing workers, equipment failure and media escalation**, requiring them to make time-critical decisions under uncertainty. Each team assumed specific operational roles and carried out a **role-play exercise** to simulate coordination between command centers, field responders, and external stakeholders.

Following the exercise, teams made **presentations** summarizing their response strategies and rationale for the decisions taken. Their performance was **evaluated and scored** based on **ERDMP compliance, communication efficiency, situational analysis and overall decision effectiveness**. The session generated lively interaction, peer learning, and reflection on the challenges of real-time crisis management.

In his closing remarks, Dr. Dubey emphasized that **leadership in emergencies is defined not by authority, but by clarity, collaboration and adaptability**. He reiterated that effective crisis management depends on preparedness, training and the ability to make informed decisions even in uncertain and stressful situations.

Day 3 of the training program began with technical sessions that built upon the learnings of the previous days, focusing on **post-emergency recovery planning, sustainability frameworks, and climate resilience strategies** to enhance organizational preparedness. The day emphasized **translating knowledge into practical action** and highlighted the need for **continuous improvement in emergency management** across the oil and gas sector.

Session 9: Post-Incident Recovery and Business Continuity Planning (BCP)

A technical session on **"Post-Incident Recovery and Business Continuity Planning (BCP)"** was conducted by **Mr. Rajesh Nigam, Former Executive Director, Indian Oil Corporation Ltd**. Drawing upon his vast operational experience and referencing the PNGRB's **ERDMP Regulations, 2010**, Mr. Nigam emphasized that preparedness does not end with the mitigation of an incident—it must extend to systematic **recovery, restoration and continuity of operations**. He explained that the **ERDMP and BCP frameworks are interdependent**, where ERDMP focuses on immediate emergency response and BCP ensures that essential business processes resume with minimal disruption and reputational impact.

The session provided an in-depth understanding of **post-incident recovery protocols**, including the responsibilities of management personnel, formation of recovery committees, and the role of the **Location In-Charge (LIC)** in coordinating restoration efforts. Mr. Nigam elaborated on the **two categories of recovery operations**—those contained within the installation (Level-I and II emergencies) and those with **off-site implications (Level-III emergencies)** requiring coordination with district authorities and external agencies. He

presented the **standard checklist for post-incident recovery** under the ERDMP, covering aspects such as **salvage operations, manpower accounting, damage assessment, root cause investigation, media communication and environmental restoration**.

The participants were guided through the **termination process of emergencies**, which includes notifying statutory authorities, conducting detailed **root cause analyses**, preparing comprehensive incident reports, and disseminating **lessons learned** across organizational units. Mr. Nigam underscored the importance of **timely reporting** to PNGRB and other regulators, along with meticulous record-keeping of mock drills, audits and follow-up actions. The session also touched upon **environmental recovery measures**, such as ambient air and effluent water monitoring, soil testing and decontamination before resuming operations, to ensure compliance with pollution control norms.

Emphasizing the integration of **digital monitoring, mutual aid mechanisms and insurance coordination** into BCP, Mr. Nigam noted that effective continuity planning minimizes downtime, protects supply chains and safeguards public trust. He concluded that **a robust BCP—rooted in safety culture, accountability and continual improvement—is indispensable for achieving organizational resilience**. Participants were encouraged to embed BCP within their ERDMP framework, ensuring that response, recovery and business continuity evolve together as part of a unified risk management strategy.

Session 10: ESG Integration and Emergency Preparedness

The was conducted by **Mr. Aditya Gurudanti, Founder and Managing Partner of The Verdant Paradigm**. The session focused on integrating **Environmental, Social and**

Governance (ESG) principles with the **ERDMP** framework in the oil and gas sector. Mr. Gurudanti highlighted that a well-designed ERDMP serves not only as a safety mechanism but also as a key driver in maintaining and enhancing ESG performance. He distinguished between *Sustainability*, which reflects an organization's outward strategy of creating positive environmental and social impact and *ESG*, which represents the measurable indicators that investors and regulators use to evaluate a company's long-term viability and responsibility.

The discussion covered key ESG focus areas for the oil and gas industry, including decarbonizing operations by reducing methane emissions and adopting renewable energy, transitioning to an integrated energy model through investments in cleaner technologies and implementing carbon capture and storage solutions to manage hard-to-abate emissions.

Mr. Gurudanti emphasized that ERDMP forms a vital operational link between emergency risk management and ESG performance, addressing environmental risks through containment and leak prevention, social risks through community protection and workforce safety, and governance risks through compliance, mock drills, and regular audits. He also explained how ERDMP activities such as mock drill performance, response time, and safety system reliability feed directly into measurable ESG metrics and global reporting frameworks like GRI and TCFD.

The session concluded with an emphasis on strengthening the organization's **social license to operate** through community engagement, awareness programs, and transparent communication, reinforcing that robust ERDMP implementation not only enhances operational safety but also contributes significantly to an organization's overall ESG credibility and resilience.

Session 11 & 12: Enhancing Climate and Disaster Resilience in Oil & Gas Sector along with Group Exercise

The afternoon sessions of Day 3 were conducted by **Dr. Rakesh Dubey, Former Director, Disaster Management Institute (DMI), Bhopal**, focusing on **climate and disaster resilience** and the **practical preparation of ERDMPs for certification**. He highlighted the growing relevance of climate-induced hazards to energy infrastructure and the need to embed climate adaptation measures into disaster management and operational planning.

Dr. Dubey discussed the increasing frequency of **climate hazards** such as floods, cyclones, extreme heat and heavy rainfall, emphasizing their implications for refineries, terminals and cross-country pipelines. He explained how exposure to these hazards can disrupt production, damage assets and create cascading operational risks. The session outlined practical **adaptation strategies**, including **cyclone protection systems, heat resilience measures, structural retrofitting and emergency water management planning**. Participants were engaged in a **group activity** to **design a climate-resilient oil terminal**, applying the concepts of hazard mapping, risk mitigation, and resilient infrastructure design. The exercise encouraged creative thinking and sector-specific solutions for building adaptive capacity against climate and disaster risks.

Dr. Dubey facilitated a comprehensive group exercise on **ERDMP preparation and certification processes**, aimed at reinforcing participants' understanding of the PNGRB regulatory framework. The participants were divided into **five groups**, each representing a key segment of the petroleum and natural gas industry — **Refineries, LPG Bottling Plants, POL Terminals, City Gas Distribution (CGD) Networks and Cross-Country Pipelines**.

Each group was tasked with developing a draft **Emergency Response and Disaster Management Plan (ERDMP)** for their respective facility type, covering essential elements such as risk assessment, command structure, communication flow, resource inventory, and coordination mechanisms.

The exercise also required participants to outline the **process for obtaining ERDMP certification**, including documentation, audits and third-party verification requirements. Each group presented their ERDMP framework through short PowerPoint presentations, showcasing their understanding of the planning and certification process. The interactive nature of the exercise allowed participants to exchange ideas, address common implementation challenges and appreciate the practical aspects of ERDMP development under PNGRB regulations.

In his concluding remarks, **Dr. Dubey** commended the participants for their active involvement and emphasized that **climate resilience, robust ERDMP implementation and continual capacity building** are essential pillars for ensuring the safety and sustainability of India's oil and gas sector.

CLOSING OF THE PROGRAM

The **three-day Capacity Building Program on Emergency Response and Disaster Management Plan (ERDMP)** concluded on **13th November 2025** with a formal **closing session** held at the **GIDM Campus, Gandhinagar**. Representatives from **PNGRB** and **GIDM** expressed appreciation to the expert speakers and participants for their active involvement and enthusiasm throughout the program. The closing remarks emphasized the importance of translating the knowledge gained into practical measures to strengthen **emergency preparedness, risk mitigation and resilience** within the oil and gas sector.

As part of the concluding proceedings, **feedback from participants was collected**, reflecting a high level of satisfaction with the program content, delivery and overall learning experience. Participants commended the program's **practical orientation, interactive exercises and real-world case discussions**, noting that the sessions significantly enhanced their understanding of **ERDMP implementation and compliance**. The event concluded with the **distribution of certificates** and a formal **vote of thanks**, marking the successful completion of a productive and insightful three-day training program.

ANNEXURE 1: PROGRAM NOTE

1. Background

India's petroleum industry is expanding, with a total of 23 refineries across the country, boasting a combined refining capacity of 256.816 MMTPA as of April 2024. India's petroleum industry is a comprehensive sector encompassing exploration, production, refining, distribution, and marketing of petroleum and its by-products. This includes upstream, midstream and downstream activities. This includes upstream activities that cater to the extraction of crude oil and natural gas, midstream activities such as transportation and storage, and downstream processes that include refining and distribution of fuels like petrol, diesel, LPG, and kerosene. India ranks among the top five refining nations globally, thanks to its robust infrastructure and strategic geographic location. The country is the seventh-largest exporter of refined petroleum products. Facilities like the Jamnagar refinery, one of the world's largest, underscore India's dominance in the refining sector. India's refining capacity is expected to grow to 300 MMTPA by 2028 as per estimates, with 58% of the increase coming from brownfield expansions, while the remaining growth, totaling 18 MMTPA from greenfield projects.This global standing enhances India's energy security and positions it as a key player in international energy markets. The International Energy Agency (IEA) in February 2024 assessed that India will become the largest source of global oil demand growth between now and 2030. India is the second-largest economy in biofuel blending, following Brazil.

This industry also provides direct and indirect employment to millions, spanning exploration, refining, distribution, and retail sectors. The industry's value chain supports ancillary industries such as petrochemicals, logistics, and manufacturing. The sector enhances socio-economic stability by fostering skill development and offering diverse career opportunities. The petroleum industry's expansion has multifaceted implications. Economically, it boosts GDP, foreign exchange earnings, and industrial growth. Politically, energy independence strengthens India's global standing and reduces strategic vulnerabilities. Socially, the industry's growth promotes rural development through improved energy access and employment.[1]

Chemicals, being an integral component of modern industrial systems, have garnered significant attention within the government, private sector, and broader community regarding disaster management. The frequency and severity of chemical disasters have surged in recent years, exemplified by the Bhopal Gas Tragedy with leak, being the most prominent and

[1] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2096817

devastating till the L G Polymers incident with Styrene gas leak during the COVID- 19 pandemic in 2020 known as Vizag gas leak. The resulting vapour cloud spread over a radius of around 3.0 km (1.9 mi), affecting the nearby areas and villages. Few major chemical incidents that took place during the last 25 years include an explosion in IPCL Gas Cracker Complex at Nagothane in Maharashtra (1990); fire in an oil well in Andhra Pradesh (1995); vapour cloud explosion at HPCL refinery at Vishakhapatnam (1997); MS Tank Fire broke out in Digboi Assam (2003); IOCL Fire Tragedy of Jaipur (October 2009) and IOCL Hazira Tank Fire (2013). This rise can be attributed to the rapid expansion of chemical industries across various sectors, including manufacturing and formulation, other-chemicals, pharmaceuticals, agro-chemicals (fertilisers, pesticides), industrial chemicals, and facilities dedicated to handling hazardous chemicals such as oil depots, exploration/mining operations, and others. The expansion of plant sizes, storage capacities, and carriers, particularly in densely populated areas, has heightened the risk and vulnerability to such disasters.

In light of this, a comprehensive legal and institutional framework exists in our country. Several regulations governing safety in transportation, liability, insurance, and compensation have been enacted. The relevant provisions on chemical disaster management in our country include [2]:

- The Petroleum and Natural Gas Regulatory Board Act 2006
- The Explosives Act 1884
- The Petroleum Act 1934
- The Factories Act 1948
- The Insecticides Act 1968
- The Environment Protection Act 1986
- The Motor Vehicles Act 1988
- The Public Liability Insurance Act 1991
- The Disaster Management Act 2005
- The Disaster Management (Amendment) Act 2025.

Government of India has further reinforced the legal framework on chemical safety and management of chemical accidents by enacting new rules such as Manufacture, Storage, and Import of Hazardous Chemicals (MSIHC) Rules 2009; The Chemcial Accidents (Emergecy Planning, Preparedness and Planning (EPPR)) Rules 1996; Static and Mobile Pressure Vessels (Unfired) (SMPV) Rules, 2016; The Central Motor Vehciles CMV Rules 1989; The Gas Cylinder Rules 2016; Hazardous Waste Management Rules; The Dock Workers (Safety, Health & Welfare), Regulations 1990 and by way of amendments to them.

[2] https://nidm.gov.in/pdf/modules/chemical.pdf

With a focus on sustainability and energy efficiency, India is poised to maintain its leadership in the global energy landscape while aligning with its climate commitments. As the downstream petroleum and gas infrastructure expands rapidly across the country, the need for enhanced risk management capabilities, emergency response systems, and safety standards is greater than ever.

1.1 Introduction

The Disaster Management Act 2005, the Disaster Management Amendment Act 2025, and the Petroleum and Natural Gas Regulatory Board (PNGRB) Regulations (Codes of Practice for Emergency Response and Disaster Management Plan (ERDMP) Regulations, 2010) have mandated the implementation and preparation of disaster management/emergency plans. Despite the existence of these acts and policies, there are ongoing challenges regarding coordination, planning, and the implementation of these duties. The primary cause of these challenges is the lack of adequate understanding and skills among relevant stakeholders. In response to these challenges, it is proposed to organise a series of training programs on ERDMP. The current focus aligns with the principles of "zero tolerance" and "extended producer liability," which address risks throughout the lifecycle of a hazardous material.

Emergency Response and Disaster Management Plan (ERDMP) is applicable to following :-

a) hydrocarbons processing installation (refinery, gas processing, LNG Re-gasification installations etc.);
b) pipeline such as natural gas, propane, butane etc. and the hydrocarbons products which remain in gaseous state at NTP;
c) petroleum and petroleum product pipeline;
d) petroleum storage facilities including POL depot, installations and terminals;
e) hydrocarbons gas bottling Installations having receiving, storage and handling facilities including storage for LPG, propane and butane;
f) city or local natural gas distribution facilities;
g) retail outlets dispensing like Petroleum, Auto LPG, LNG, CNG and like other retail outlets;
h) transportation of petroleum products [LNG, CNG etc.] by road;
i) any other installation as may be notified by the Board from time to time;

Therefore GIDM has developed the programme for the capacity development to cover all entities as noted above from (a) to (i).

1.2 Aim

The aim of the training and capacity building programs is to update the knowledge and skills of the participants to multi-dimensional aspects of disaster risk management and emergency

incident response, effective planning, integration and coordination delaing with petroleum and natural gas.

1.3 Objectives

The objectives of the program on 'Capacity Building on Emergency Response and Disaster Management Plan (ERDMP)' are to enable participants to assess and deliver the respective aspects and roles about emergency/disaster management, delineate strategies for risk mitigation, and implement effective response and preparedness activities.

The objectives of the training and capacity-building program are to enable participants to:

- Understand the scenario and challenges associated with disaster risks and the consequences associated with oil and natural gas.
- State various legal/regulatory frameworks, provisions, guidelines, and institutional arrangements concerning activities.
- Enumerate various tools, technologies, and methods in chemical disaster management, including GIS, ICT, and web-enabled systems.
- Accident reporting, investigation, risk assessment, and root cause analysis.
- Capacity building in disaster risk management, safety, and emergency preparedness.
- Training, skill development, and knowledge sharing for oil and gas professionals.
- Documentation and development of ERDMP.
- Technical support and guidance to industry stakeholders for aligning with regulatory and international safety norms.

1.4 Training Content

The training shall cover the following aspects of ERDMP, and will be drawn looking to the target participants, resources and contexts of the particular batch and course programme:

- Understanding the Basics of Disaster Risk Management
- Deep understanding on hazards involved in oil and gas sector
- Disaster Response and Incident Response System in India
- Mechanism of Emergency Response with respect. ERDMP Regulations
- Sectoral Recovery and Resilience Building
- Disaster Recovery in the Energy Sector
- Development of ERDMP
- Resilience building in Energy Sector

1.5 Training Approach

The training approach will be selected based on the specific topic of ERDMP, from a range of the following options:

- Documentary/film followed by question-and-answer sessions based on real-life incidents
- Lecture followed by query-and-answer sessions
- Presentation (slides) and discussion
- Group discussion
- Group work/assignment - GIDM's 5-hour course on DRM
- Study exposure visits followed by discussion
- Mock exercises/drills/simulation/tabletop exercises

1.6 Target Group

The training programme is designed to meet the specific requirements of middle-level officials dealing with petroleum and natural gas in Public Sector Undertakings (PSUs), industries/factories and various aspects of disaster management, environmental development, and other relevant fields.

- HSE Officers
- Safety Officers
- Fire and Safety Personnel
- Middle-level officials from PSUs, industries and factories handling petroleum and natural gas operations.

1.7 Expected Results

- Better assessment of chemical disaster (oil and natural gas) related risks and vulnerabilities
- Systematic approach in planning, preparedness and mitigation of such disasters
- Improved coordination amongst various agencies and organisations
- Integration of onsite and offsite plans with Disaster Management Plans and holistic DRR framework
- Equipped to Develop and get an audited ERDMP document in line with the regulations

1.8 Training Duration and Location

The training will be conducted over 3 days at the **GIDM Campus, Village Raisan, Gandhinagar- 382007.**

1.9 Monitoring and Evaluation

- Pre- and post-training assessments to evaluate knowledge and skill improvement
- Feedback sessions to gather participant insights

Agenda of the Program

DAY 1 || 11 NOVEMBER 2025

Time	Session	Speakers
10.00 – 10.30	Welcome & Registration	*GIDM*
10:30 - 11:00	Opening Ceremony and Introductory Remarks - **Welcome Address by Secretary, PNGRB**	*GIDM & PNGRB*
11:00 - 12:00	**Understanding of Disaster Risk Management (DRM)** - Key Concepts: Hazard, Risk, Vulnerability, Resilience - National Disaster Management Act (2005 & Amendment 2025) - Global Frameworks on DRM	***Mr Nisarg Dave*** *Director (DM), GIDM*
12:00 – 12:15	*Tea/ Coffee Break*	
12:15 – 13:30	**Hazard Identification & Risk Assessment** - Introduction to PNGRB ERDMP Framework - Salient Points of PNGRB Regulations 2010 (Annexures, Checklists and Schedule) - Classification of Emergencies (Level I–III) - Onsite/Offsite Hazards + Use of MSDS and Annexure I - Risk Matrix, ALARP Concept, Threshold Criteria	***Mr Manish Dhroov*** ***VP - HSE & AI*** *Gujarat Gas, Gandhinagar*
13:30 – 14:30	*Lunch*	
14:30 – 15:30	**Scenario-Based Group Work: Quantitative Risk Assessment (QRA)** - Case Exercises: Pipeline rupture, tank truck fire - Risk estimation, zone mapping, consequence modelling	***Shri. Hirak Dutta,*** *Advisor, PNGRB*
15.30 – 15.45	*Tea/ Coffee break*	
15.45 – 17.00	**Risk Assessment in Action: Learning from Real-World Good Practices** - Tatipaka NG pipeline Catastrophic Incident of GAIL; - Styrene Gas Leak Incident; - Richmond Refinery Major Fire incident at California; - Jaipur & Buncefield terminal catastrophic Incidents.	***Shri. Hirak Dutta,*** *Advisor, PNGRB*

DAY 2 || 12 NOVEMBER 2025

Time	Session	Speakers
10:30 - 11:45	**International Best Practices in Emergency Management** - COMAH (UK), OSHA (US), API Standards - ICS (Incident Command System) Structure - Use of AI, sensors, and smart alerts in ERDMP - Tools for predictive analytics, real-time data analysis, automated decision-making, and optimised resource allocation. - Use of AI-powered Drones and Robotics	***Mr. Vidiyala Ravi*** *EHS Expert,* *Advisor - PI Foundation*
11.45 – 12:00	*Tea/ Coffee Break*	
12:00 – 13:15	**Learning from Near-Miss Reporting** - Real-world PSU case examples - Root cause discussion using Bowtie/ Fault Tree methods - Organizational learning from failure signals - Behavioural (Human) Aspects	***Mr. Prakash Dasputre*** *HSE Expert*
13:15 – 14:15	*Lunch*	
14:15 – 15:30	**Leading Through Crisis: Tactical Decision-Making in Emergencies (Part I)** - Emergency Room Simulation - Role-play: Missing workers, media escalation, equipment failure	***Dr. Rakesh Dubey*** *Former Director DMI, Bhopal*
15.30 – 15.45	*Tea/ Coffee break*	
15.45 – 17.00	**Leading Through Crisis (Part II)** - Team Presentations - Scoring based on ERDMP compliance, communication efficiency and decision effectiveness	***Dr. Rakesh Dubey*** *Former Director DMI, Bhopal*

DAY 3 || 13 NOVEMBER 2025

Time	Session	Speakers
10:30 - 11:45	**Post-Incident Recovery and Business Continuity Planning (BCP)** - BCP alignment with ERDMP - Logistics & vendor readiness - Environmental, financial, and public trust recovery	***Mr. Rajesh Nigam*** *Former Executive Director, Indian Oil*
11.45 – 12:00	*Tea/ Coffee Break*	
12:00 – 13:15	**ESG Integration and Emergency Preparedness** - ESG expectations in oil & gas - KPIs and ERDMP synergy - Community and regulator engagement strategies - Public information management & Media management	***Mr. Aditya Gurudanti*** *ESG Expert*
13:15 – 14:15	*Lunch*	
14:15 – 15:15	**Enhancing Climate and Disaster Resilience in Oil & Gas Sector** - Climate hazards and infrastructure exposure - Adaptation measures: flood protection, heat resilience - Group activity: Design a climate-resilient terminal	***Dr. Rakesh Dubey*** *Former Director DMI, Bhopal*
15.15 – 15.30	*Tea/ Coffee break*	
15.30 – 17.00	**Group Exercise and PPT** - Group (Refinery) - I (Making ERDMP and process of getting Certification) - Group (LPG Bottling Plant)- II (Making ERDMP and process of getting Certification) - Group (POL) - III (Making ERDMP and process of getting Certification) - Group (CGD) - IV (Making ERDMP and process of getting Certification) - Group (Cross country pipelines) - V (Making ERDMP and process of getting Certification)	***Dr. Rakesh Dubey*** *Former Director DMI, Bhopal*
17.00 – 17.30	**Closing Session** - Summary of key learnings - Feedback - Certificate distribution and vote of thanks	*GIDM/ PNGRB*

ANNEXURE 2: PARTICIPANT LIST

#	Participant Name	Designation and Department
1	Kenil Narotambhai Dhanani	Executive, Torrent Gas Ltd.
2	Mahesh Kore	Senior Manager, Mahanagar Gas Ltd.
3	Nikunjkumar Mahendrabhai Patel	Assistant Manager, Torrent Gas Ltd.
4	Vaaman Vasishth	Assistant Consultant, PNGRB
5	Prashant Giripunje	General Manager (F&S), GAIL (India) Ltd.
6	Arindam Chakraborty	Senior Executive Operations, Super Gas
7	Chirag Lalitkumar Nimavat	Deputy Manager, Adani Gas
8	Sabuj Kumar Parua	Senior Terminal Engineer, Super Gas
9	Rudragiri Goswami	Safety Officer, Super Gas
10	Rohan Jaiwant Shelar	Chief Manager, Mahanagar Gas Ltd.
11	Nikunj J. Dhaduk	Shift Superintendent (Operations), Shell India
12	Rajasekaran Raman	Deputy Manager, Petronet MHB Ltd.
13	Venkitesh N	Chief Manager (O&M), Mahanagar Gas Ltd.
14	Jayesh Namdev Jadhav	Assistant Manager, Mahanagar Gas Ltd.
15	Ankit Kumar	Dy. Manager, Indraprastha Gas Ltd.
16	Selvam K	Chief Manager, Mahanagar Gas Ltd.
17	Abdul Wahab V.	Plant Engineer, Super Gas
18	Kiran Chaitanya	Shift Superintendent (Operations), Shell India
19	Arvind Kumar Chakrawati	Chief Manager, HSSE I/C, Bharat Petroleum Corporation Ltd.
20	Anuj Tiwari	Senior Manager (Fire & Safety), Indraprastha Gas Ltd.
21	Rajesh N.	Manager, Petronet MHB Ltd.

#	Participant Name	Designation and Department
22	Trivedi Deepakkumar Ghanshyambhai	Senior Officer, Gujarat Gas Ltd.
23	Niraj Kumar Chaudhary	Assistant Manager (HSSE), Bharat Petroleum Corporation Ltd.
24	Shubham Rajendra Suryavanshi	Associate Executive, Bharat Petroleum Corporation Ltd.
25	Asavari Pawan Palshetkar	Chief Manager, Mahanagar Gas Ltd.
26	Sivasubramaniam A.	Manager (Ops), Pipelines-VBPL, Bharat Petroleum Corporation Ltd.
27	Satish Arun Dixit	Chief Manager (Fire And Safety), Mangalore Refinery and Petrochemicals Ltd.
28	Himalay Kotadiya	Senior Officer, Konkan LNG Ltd.
29	Pradip Pramanik	Chief Manager, Aegis Logistics Ltd.
30	Sukant Kumar Singh	DGM (Fire & Safety), GAIL (India) Ltd.
31	Jiten Thaker	Senior Manager (HSE), Quantum Corporation

GUJARAT INSTITUTE OF DISASTER MANAGEMENT

BUILDING RESILIENCE

Building a resilient and sustainable society

Participant Feedback Analysis Report

Event: Capacity Building Program on Emergency Response and Disaster Management Plan (ERDMP)

Organizers: PNGRB and GIDM

Dates: 11th – 13th November 2025

1. Executive Summary

Feedback for the program was collected through an online feedback system, enabling participants to conveniently submit their responses digitally. Participants evaluated the sessions and speakers across key parameters, including content quality, clarity of presentation, relevance to ERDMP and field operations, engagement and interaction, effectiveness of training aids and methodology and overall satisfaction with the training. This online approach ensured quick, organized and comprehensive feedback collection for accurate program assessment.

2. Speakers and Faculty Evaluation

Participants evaluated every session based on the quality of content shared, its relevance to ERDMP practices, the clarity and depth of explanations, and the practical applicability of the information presented. These ratings provided valuable insights into how well each topic met participant expectations and contributed to their learning objectives. The detailed percentage-based session-wise ratings, which reflect the strengths and areas for further enhancement across individual sessions, are presented in **Annexure 1**.

3. Program Design & Relevance

Participants also shared their overall impressions of the program through feedback, reflecting strong satisfaction with the training content and its applicability. The **Relevance of the Training Program Content** received a high rating of **82%**, indicating that participants found the topics closely aligned with operational and regulatory needs. The **Usefulness of the Training Program Content** was rated at **80%**, demonstrating that the information and insights provided were considered valuable for enhancing workplace preparedness and decision-making. **Overall, the programme received an 81% rating**, highlighting a positive reception and affirming the training's effectiveness in meeting participant expectations.

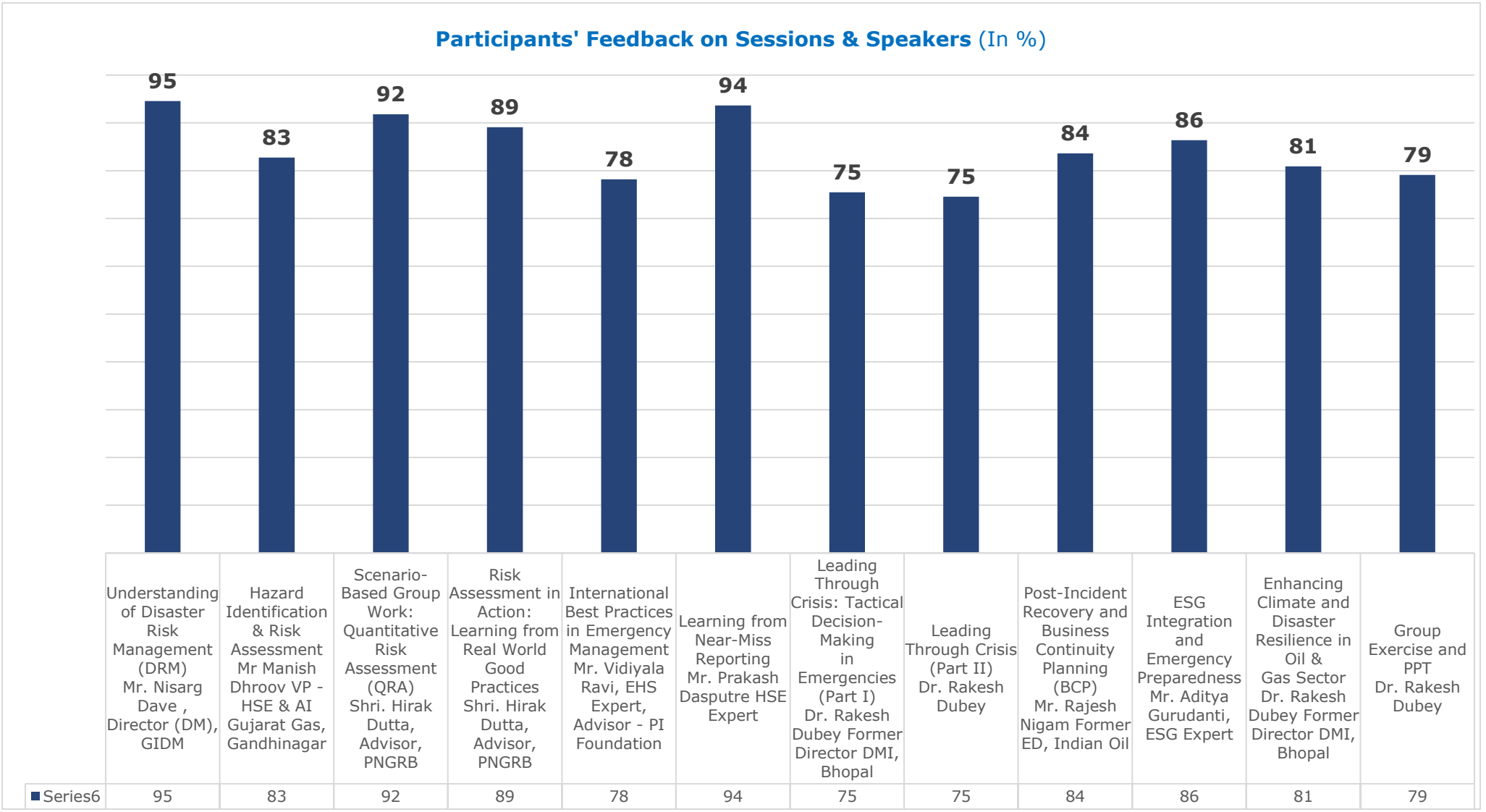
4. Key Highlights from Participant Comments

- Participants praised the **expertise, clarity and practical insights** of the resource persons, noting that the sessions were informative and useful.
- Several suggested improving **presentation quality**, adding **more visuals, videos and case studies** and increasing **session duration** for complex technical topics.
- Most participants stated they could apply the training in their organizations by enhancing **ERDMP preparation**, improving **emergency response practices**, sharing knowledge with colleagues and strengthening **day-to-day operational safety**.
- Participants recommended incorporating **industrial/ site visits**, more **hands-on exercises**, deeper coverage of **PNGRB guidelines** and disaster management frameworks and offering **sector-specific programmes**.
- Additional suggestions included launching **online certification courses**, adding **video-based demonstrations**, increasing **programme frequency** and using **digital platforms** for flexible learning.
- Feedback for GIDM was largely positive, praising the **coordination, hospitality and management**, with provision of **single-occupancy rooms** and to expand future batches to include more participants.

5. Conclusion

Overall, the participant feedback reflects a highly positive response to the ERDMP Capacity Building Program, confirming its strong relevance, practical value and effective delivery. Participants appreciated the expertise of the speakers and the usefulness of the training content, while also offering constructive suggestions such as incorporating more practical exercises, case studies and industrial visits to further enhance future programmes. The feedback indicates that the training successfully strengthened participants' understanding of emergency response and regulatory requirements, with opportunities identified for continued improvement and expanded learning formats.

Annexure 1: Percentage-Based Ratings of Sessions and Speakers



	Understanding of Disaster Risk Management (DRM) Mr. Nisarg Dave , Director (DM), GIDM	Hazard Identification & Risk Assessment Mr Manish Dhroov VP - HSE & AI Gujarat Gas, Gandhinagar	Scenario-Based Group Work: Quantitative Risk Assessment (QRA) Shri. Hirak Dutta, Advisor, PNGRB	Risk Assessment in Action: Learning from Real World Good Practices Shri. Hirak Dutta, Advisor, PNGRB	International Best Practices in Emergency Management Mr. Vidiyala Ravi, EHS Expert, Advisor - PI Foundation	Learning from Near-Miss Reporting Mr. Prakash Dasputre HSE Expert	Leading Through Crisis: Tactical Decision-Making in Emergencies (Part I) Dr. Rakesh Dubey Former Director DMI, Bhopal	Leading Through Crisis (Part II) Dr. Rakesh Dubey	Post-Incident Recovery and Business Continuity Planning (BCP) Mr. Rajesh Nigam Former ED, Indian Oil	ESG Integration and Emergency Preparedness Mr. Aditya Gurudanti, ESG Expert	Enhancing Climate and Disaster Resilience in Oil & Gas Sector Dr. Rakesh Dubey Former Director DMI, Bhopal	Group Exercise and PPT Dr. Rakesh Dubey
Series6	95	83	92	89	78	94	75	75	84	86	81	79