Stakeholder Conference on the Global Framework on Chemicals

Aug 14, 2026 | Chennai, Tamil Nadu

Toxics Link

for a toxics-free world

Stakeholder Conference on the Global Framework on Chemicals

Chennai

Date	14th August 2026
Venue	Savera Hotel, Chennai
Time	10:15 AM – 4:20 PM
Lunch Break	1:30 PM – 2:15 PM
Organised by	Toxics Link
Theme	Global Framework on Chemicals

1. Purpose of the Meeting

The stakeholder conference was convened to introduce and discuss the Global Framework on Chemicals (GFC), its relevance to Tamil Nadu, and the implications of international chemicals-related agreements, including the Stockholm and Minamata Conventions. The meeting sought to bring together policymakers, researchers, academia, industry representatives, civil society organisations and other stakeholders to identify gaps in chemicals management, discuss emerging concerns and explore opportunities for stronger science–policy–industry collaboration.

2. Proceedings and Key Discussions

10:15–10:30 AM | Opening and Welcome Remarks – Mr. Piyush Mohapatra, Sr. Programme Coordinator, Toxics Link

Mr. Piyush Mohapatra welcomed the participants and explained the rationale for convening the meeting in Chennai. He highlighted previous work and discussion of Toxics Link on persistent organic pollutants (POPs), plastics and related issues, but that the broader issue of chemicals management.

He highlighted the importance of taking global discussions on chemicals management happening at national and ministerial level and bringing them to states. Since, Tamil Nadu is an important state for this discussion given its broad industrial sectors, including textiles, chemicals and other manufacturing sectors.

The meeting was organised in association with SRM Institute of Science and Technology, the Citizen Consumer and Civic Action Group (CAG), and LivBio. Mr. Piyush welcomed the distinguished experts and invited participants to use the meeting as a platform for knowledge exchange and future collaboration.

10:30–10:50 AM | Inaugural- Mr. Satish Sinha, Associate Director, Toxics Link

Mr. Satish Sinha discussed the important role of the chemical industry in India's economic development and in improving the quality of life. He highlighted that chemicals are extensively used across several major sectors, including pharmaceuticals, agrochemicals, petrochemicals, textiles, food and agriculture. The Indian chemical industry is growing at an estimated rate of around 5–7% annually and contributes approximately 7% to India's GDP, demonstrating its significant economic importance. However, he emphasized that while chemicals provide substantial benefits, their use also has a significant downside in terms of potential impacts on human health and the environment. These concerns need to be addressed across the complete life cycle of chemicals, including their manufacture, use, transportation, storage, release into the environment, treatment and disposal. Over the past two to three decades, increasing scientific evidence has demonstrated the health and environmental impacts associated with hazardous chemicals, particularly in developing economies. At the same time, countries such as India face a

lack of adequate national data on chemical exposure, persistence, degradability, health impacts and environmental contamination, resulting in considerable dependence on data generated in developed countries.

A key concern raised by Mr. Sinha was the inadequacy of chemical regulation and implementation in India. Particularly for the hazardous chemicals whose risks are already well established. He emphasized that having regulations alone is not sufficient; effective implementation, monitoring, laboratory capacity and institutional mechanisms are equally important. He also discussed India's engagement with international chemicals and environmental frameworks, including the Stockholm and Rotterdam Conventions and the transition from the Strategic Approach to International Chemicals Management (SAICM) towards the **Global Framework on Chemicals (GFC)**. SAICM, which operated for approximately two decades, was intended to promote sound chemicals management globally but did not achieve the desired level of progress. The Global Framework on Chemicals has therefore emerged as a new global approach, with greater emphasis on measurable targets, commitments, implementation and reporting by participating countries. India is part of this framework, but awareness regarding its objectives, emerging issues and implications for different industrial sectors remains limited among industries and other stakeholders.

Mr. Sinha particularly emphasized the importance of the **textile sector**, given India's position as a major textile-producing country and the sector's extensive dependence on chemicals, dyes and other chemical formulations. Textile production can result in significant chemical releases and wastewater discharges, making improved chemical management particularly important. He stressed that industries should not simply wait for future regulations but should proactively prepare by identifying hazardous and restricted chemicals, developing and adopting safer alternatives, improving chemical-use practices and strengthening effluent and wastewater management systems. He further highlighted the growing international concern regarding **PFAS (per- and polyfluoroalkyl substances)** and noted that India needs greater attention and preparedness regarding such emerging chemical issues. He also pointed to gaps in India's engagement with chemicals listed under international conventions and the need to strengthen national action on hazardous chemicals. Overall, the speech emphasized that India's chemical industry can continue to grow while ensuring stronger protection of human health and the environment, but this will require a shift towards proactive and life-cycle-based chemicals management, stronger regulatory implementation, better national data and research, safer chemical alternatives, improved industrial practices and greater awareness of international chemicals-management frameworks.

The discussion then moved to the evolution of global chemicals governance, from SAICM to the Global Framework on Chemicals. Satish noted that the GFC provides a renewed global platform for improving chemicals management, with greater emphasis on measurable commitments and action by countries. He stressed that Indian stakeholders, particularly industry and state-level institutions, need to understand the framework and prepare proactively.

Textiles were highlighted as an important sector in the global chemicals-management agenda because of the large number of chemicals used and the potential for environmental releases. The need for safer alternatives, improved effluent management, transparency and preparedness was emphasised. Emerging concerns such as PFAS were also identified as requiring greater attention in India.

10:50–11:15 AM | Keynote Address – Dr. Jayanthi, former Chairperson of the Tamil Nadu Pollution Control Board

Dr. Jayanthi emphasized the importance of the Global Framework on Chemicals (GFC) and its implications for India, particularly in the context of sustainable development and chemical safety. She highlights that India is the sixth-largest chemical producer globally and the third-largest in Asia. She stated that chemical management should not be considered the sole responsibility of environmental regulators but should be integrated into industrial policy, public health, agriculture, labour, consumer protection and environmental governance. India's roadmap for implementing the Global Framework on Chemicals should focus on three core pillars: robust regulation, technological innovation, and inclusive partnerships, with adequate financial support as an important enabling factor.

She highlighted the need to modernize India's regulatory landscape by establishing a strong legal foundation for the sound management of chemicals throughout their life cycle. She ask to refer to the proposed Indian Chemicals Management and Safety Rules (ICMS) as an opportunity to develop a comprehensive system for registering, evaluating and restricting hazardous substances. She also emphasized the importance of data transparency and accurate chemical-risk tracking. Drawing from her experience in Tamil Nadu, including incidents such as oil spills and ammonia leaks, she stated that industries and authorities need to develop preparedness plans before accidents occur. In particular, larger industries and industries located in vulnerable areas should have mandatory emergency and preparedness plans, rather than relying only on reactive measures after an incident.

Dr. Jayanthi further emphasized the importance of green chemistry, technological innovation, cleaner production and research and development. Industries should invest in technologies that reduce toxic emissions, minimize waste and lower energy consumption. She also stressed the need to empower workers and communities through

occupational safety, capacity building and public awareness. Chemical safety should include consideration of issues such as workers' rights, human rights and child labour, as well as the safety of communities living around industrial facilities. She highlighted that regulatory compliance should therefore extend beyond the industrial premises to consider workers and surrounding communities.

Another important point was that implementation of chemical-management requirements should consider the specific characteristics of different industrial sectors and clusters rather than applying exactly the same approach to every industry. Referring to Tamil Nadu's textile processing, leather tanning, automobile manufacturing and chemical industries, she suggested that industrial clusters should be identified according to the chemicals they use and the risks they pose. These clusters should receive regular awareness programmes, monitoring and localized pollution-control measures involving industries, workers and nearby communities. She also encouraged larger industries to take greater responsibility for environmental monitoring and innovation, including developing or supporting mobile monitoring facilities for air, water and noise pollution instead of relying entirely on government resources and lengthy procurement processes.

She also called for stronger industrial enforcement, international cooperation and access to clean-technology and financial support. Industrial associations should study the Global Framework on Chemicals and make use of international best practices, technical assistance and clean-technology funds to improve infrastructure and chemical-management systems. She emphasized the importance of involving experts with international experience in policy committees and localized implementation frameworks. At the same time, the experiences of workers and people living around industrial areas should be incorporated because they can provide valuable information about practical challenges that may not be visible to policymakers.

Dr. Jayanthi particularly stressed the importance of mapping and sharing successful pilot projects. She noted that some industries may already be implementing cleaner technologies, but such initiatives often remain isolated and are not known to other industries within the state. Successful pilots should therefore be documented, mapped and promoted so that other industries, particularly MSMEs, can learn from and replicate effective practices. Larger industries with greater financial and technical capacity should support smaller industries in accessing knowledge, technology and international experience. She emphasized that industries and institutions working in isolation will not lead to broad improvement across the state.

She highlighted the multi-stakeholder nature of the Global Framework on Chemicals, which brings together government, private-sector organizations, NGOs, intergovernmental organizations, youth and academia. She advocated stronger participation from departments such as labour and pollution control and recommended establishing scientific cells within government departments and organizations. These cells could identify scientifically interested personnel, encourage them to participate in relevant programmes, and ensure that knowledge gained from stakeholder meetings and training is communicated within their organizations. This would help create institutional continuity and build long-term technical capacity.

11:15–11:35 AM| Expert Remarks – Dr. R. Venkatesh, Adjunct Professor IIT Mandi, Former Consultant UNESCO

Dr. Venkatesan emphasized the importance of the Global Framework on Chemicals and the need for stronger collaboration among scientists, policymakers, industries, researchers and other stakeholders to address chemical-related challenges. Reflecting on his experience in international programmes and environmental conventions, he noted that India has played an important role in global discussions on chemicals and environmental protection. He referred to scientific evidence, including studies on chemical bioaccumulation in fish and impacts observed in different regions, which contributed to the growing recognition of the need for international agreements and frameworks for chemicals management. He also drew attention to the importance of regional cooperation and

preparedness, particularly in relation to chemical releases and oil spills. Based on his experience with contingency planning and coordination among countries, he stressed that industries, ports and relevant authorities should maintain proper preparedness plans and documentation so that they can respond effectively to environmental emergencies rather than acting only after an incident occurs.

A major theme of his remarks was the critical importance of reliable and continuous data collection. He explained that policymakers cannot effectively respond to environmental and chemical issues without authenticated scientific information and datasets. There are still significant gaps in monitoring, particularly in areas such as the marine environment, chemical emissions and long-term exposure. He highlighted the need to strengthen monitoring and sensor technologies so that chemical and environmental changes can be measured accurately. In his view, investments in sensors and monitoring infrastructure are as important as investments in other emerging technologies because technologies such as artificial intelligence can only provide meaningful results when reliable data are available. He also stressed the need to study the long-term effects of chemicals, including bioaccumulation and their potential movement through food chains, because chemical exposure is not restricted to industrial settings but is also part of everyday domestic life.

Dr. Venkatesan further emphasized the importance of citizen science and capacity building. Scientific knowledge should not remain restricted to universities, laboratories and research institutions; it should reach communities and ordinary citizens so that people can understand environmental risks and participate in monitoring and decision-making. He referred to long-term ocean monitoring as an example of how continuous datasets can reveal environmental changes that may otherwise remain unnoticed. Such evidence demonstrates the value of sustained monitoring and scientifically robust measurements. He suggested that similar approaches could be applied to chemical and environmental monitoring, with industries and research institutions working together to develop practical technological solutions.

Another important aspect of his speech was the need to encourage and recognize industries that are already developing safer technologies and products. He referred to examples of companies working on improved products and cleaner solutions but noted that such initiatives often remain poorly known because of limited awareness. These successful practices should be identified, documented and communicated so that other industries can learn from them. He particularly highlighted the challenges faced by MSMEs, which may have limited financial and technical capacity to invest in advanced chemical-management systems. Chemical handling, occupational safety and worker protection should therefore be integrated into the broader chemical-management framework rather than being treated as separate or additional responsibilities.

He also pointed to the scale of environmental contamination and the growing pressures resulting from population growth and industrial development. He referred to concerns regarding soil contamination, noting that contamination can originate from agriculture, industries and various forms of discharge. At the same time, he recognized that industries have legitimate economic needs and that policymakers must balance development requirements with environmental protection. Managing chemicals in such a rapidly changing environment requires patience, sustained collaboration and long-term commitment among stakeholders.

Dr. Venkatesan stressed that the Global Framework on Chemicals should not remain limited to chemists or environmental professionals. It needs to involve a much wider range of stakeholders, including the legal sector, universities, policymakers, industries, communities and other relevant institutions. He suggested strengthening links between environmental and legal institutions so that professionals working in law and policy are also aware of developments under the Global Framework on Chemicals. He concluded that the stakeholder dialogue was an important beginning and that continued collaboration, reliable data, scientific capacity, technological innovation, preparedness and wider public awareness will be essential for translating the Global Framework on Chemicals into effective action.

11:35 AM–12:00 PM| Expert Remarks – Dr. Sukumar Devotta, Former Professor of Eminence (Hon), Anna University, Former Director, CSIR-NEERI

Dr. Devotta reflected on the complex relationship between the chemical industry, environmental protection and sustainable development, drawing on his experience as a chemical engineer and his long-term involvement in international environmental programmes. He explained that although chemicals are essential to industrial development and economic activity, their environmental and health implications must also be carefully considered. His professional journey from chemical engineering towards environmental issues led him to work for several decades with United Nations-related committees, including the Montreal Protocol on substances that deplete the ozone layer and later the Intergovernmental Panel on Climate Change (IPCC). He emphasized that chemicals are ubiquitous and that thousands of chemicals are produced and new substances continue to enter the market every year, while information about the identity, production and use of many chemicals remains limited because of proprietary and commercial considerations. This lack of transparency creates significant challenges for effective chemicals management.

Dr. Devotta highlighted that chemical industries are economically important in India and globally, but chemical accidents and pollution can occur even in developed countries. He referred to incidents involving hazardous substances such as ammonia, emphasizing that chemicals may create risks even when they are used for purposes such as refrigeration rather than direct chemical manufacturing. Although India has standards and regulations for chemical safety, he noted that many requirements are not sufficiently mandatory or consistently followed. He also discussed the continuing challenge of hazardous-waste management and contaminated sites, pointing out that some polluted sites remain unaddressed for decades because responsibility and financing are unclear, particularly when the original owner is no longer available. Such "orphan" contaminated sites create a difficult question of who should bear the cost of remediation.

He focused on the challenges associated with multilateral environmental agreements and international negotiations. Based on his experience with the Montreal Protocol, he explained that negotiations between developed and developing countries can be difficult because countries may have very different technological and economic capacities. He described how India and other developing countries have historically emphasized the need for technology transfer and financial support when transitioning away from hazardous substances. The experience of the Montreal Protocol demonstrated that international commitments can become more feasible when developing countries are provided with appropriate financial mechanisms and access to alternative technologies. He therefore stressed that simply asking developing countries to phase out a chemical is insufficient unless technically feasible and affordable alternatives are available.

Dr. Devotta used the transition from CFCs and HCFCs to alternative refrigerants as an example of the complexity of chemical substitution. He noted that technologies and chemicals introduced by developed countries can later become subjects of international regulation because of their environmental impacts, while developing countries may still depend on those technologies. He also referred to the Kigali Amendment and the continuing challenges associated with access to suitable low-global-warming alternatives. In his view, international chemicals and environmental policies must therefore consider technology availability, financial capacity and the practical realities faced by developing countries.

He particularly emphasized the complexity surrounding PFAS (per- and polyfluoroalkyl substances). While recognizing PFAS as an important environmental concern, he argued that simply identifying PFAS as a problem is not enough; policymakers and industries also need to identify feasible, technically effective and affordable alternatives. PFAS are widely used across numerous products and industrial applications, and replacing them is particularly challenging in areas where suitable alternatives are not yet available. He also pointed out that different organizations and countries use different definitions and criteria for what constitutes PFAS, adding further

complexity to regulation and international decision-making. This variation makes it important to establish greater clarity and scientific understanding before implementing broad restrictions.

Dr. Devotta also highlighted the challenge of removing and destroying PFAS once they enter environmental matrices such as soil, products or industrial materials. PFAS cannot always be treated as a separate substance that can simply be removed from a product or contaminated site; they may be incorporated into complex materials and environmental matrices. Therefore, remediation can be technically difficult and expensive. He stressed that similar challenges exist for chemicals used in pesticides, textiles, pharmaceuticals and other industries, where chemicals can ultimately enter different environmental compartments. This reinforces the need for life-cycle thinking, prevention at source and the development of safer alternatives rather than relying only on remediation after contamination has occurred.

12:00–12:15 PM | Industry Perspective – Mr. Mahaveer Chand Bohra - Founder at Supreme Petro Chemicals. Dyes and Chemicals Merchant Association, President of Chennai Chemicals Club

Mr. Borah emphasized that the increasing number and complexity of chemicals entering industrial production and everyday life presents a major challenge for chemical safety and environmental management. New chemicals and chemical by-products are continuously generated through industrial processes, while manufacturers and traders may not always have adequate knowledge about their hazards, safe handling, appropriate use, or disposal. He stressed that, although many chemicals are unavoidable in daily life including those used in soaps, cosmetics, cleaning products, pharmaceuticals, textiles and other industries greater awareness is required among the public, industries and chemical traders regarding their safe management.

He highlighted concerns regarding hazardous chemicals that have been restricted or banned in developed countries but may continue to enter developing-country markets through industrial production and supply chains. He explained exposure to hazardous chemicals, including chemicals from pesticides and improperly disposed wastes, with serious health concerns such as cancer, asthma and liver-related diseases. He emphasized that awareness should begin at the basic level, educating communities about the safe use, handling and disposal of chemical-containing products and wastes.

Mr. Borah also highlighted the important role of researchers, industries and pollution control authorities in developing technologies for chemical waste management and resource recovery. Researchers are working to identify ways of converting chemical waste into useful resources, while regulatory authorities are taking measures to reduce the harmful effects of hazardous chemicals. However, he noted that small and medium-sized enterprises (SMEs) often lack the financial, technological and technical capacity to implement advanced treatment and disposal systems. He therefore suggested that larger industries should share successful technologies, research findings and practical solutions with smaller industries. Government and relevant committees could facilitate such knowledge and technology sharing so that successful solutions can benefit the wider industrial sector.

Referring to hazardous and chlorinated chemicals, including CTC and toluene, Mr. Borah pointed out that restrictions on certain substances can create challenges for industries when suitable alternatives are not readily available. He emphasized that chemical management should therefore go beyond simply restricting hazardous substances and should also promote safer, affordable and technically feasible alternatives, particularly for SMEs.

As a representative of the chemical trading sector and the Tamil Nadu Dyes and Chemicals Association, Mr. Borah described the association's efforts to conduct awareness programmes and engage stakeholders in discussions on chemical safety. He stressed that awareness should not be limited to individual meetings or seminars but should be supported through research, publications, technical articles and government-led communication. Clear information should be made available to industries, traders and the public regarding which

chemicals should be used safely, which should be avoided and how hazardous chemicals and wastes should be managed.

A key theme of Mr. Borah's remarks was long-term and intergenerational responsibility. He emphasized that chemical safety should not focus only on addressing present-day problems but should aim to protect future generations and support a healthier and more sustainable environment. He expressed confidence in India's scientific and technological capabilities and highlighted the contributions of institutions such as IITs and other research organisations. He encouraged stronger collaboration between researchers, industries, government authorities and professional associations to develop solutions that can benefit both India and the wider world.

12:15–12:35 PM | Participant Introductions and Stakeholder Perspectives

Participants from research institutions, academia, industry, consulting organisations and civil society briefly introduced their work and areas of interest. Key areas represented included environmental remediation, clean water and wastewater treatment, marine pollution, ecotoxicology, textiles and textile processing, waste management, product testing, PFAS research, sustainable consumption and organic products.

Several participants expressed interest in future collaboration, particularly around research, monitoring, chemical exposure assessment, wastewater treatment, remediation, sustainable textiles and capacity building. The diversity of expertise present was recognised as an opportunity to develop stronger interdisciplinary collaborations in Tamil Nadu.

12:35–1:00 PM | Closing of the Inaugural Session – Dr. Paromita Chakraborty, Professor and Head, Centre for Research in Environment, Sustainability Advocacy and Climate Change (REACH), SRMST

Dr. Paromita Chakraborty expressed her appreciation for the stakeholder meeting and emphasized the importance of bringing together experts, government representatives, researchers, industry stakeholders and young professionals to address chemicals, environmental sustainability and climate-related challenges in an integrated manner. Representing the Centre for Research in Environment Sustainability Advocacy and Climate Change, she highlighted the relevance of an Environmental, Social and Governance (ESG) perspective in understanding chemical management and sustainability issues holistically. She particularly acknowledged the leadership and guidance of Dr. Jayanthi, noting her experience in handling chemical-related accidental incidents and her ability to provide effective leadership in governance and environmental management. She also appreciated Dr. Jayanthi's support and collaboration in bilateral projects concerning plastics and chemicals, which contributed to work undertaken in Tamil Nadu.

A major point highlighted by Dr. Chakraborty was the critical need for reliable data and systematic data mapping for effective chemicals management. She noted that academic and research institutions generate substantial scientific knowledge and publications, but scientific information needs to translate into practical implications and reach the wider public. She emphasized the potential of Artificial Intelligence (AI), data mapping and dashboards to organise chemical-related information and improve understanding of chemical risks. She also highlighted the need for further research and development of sensors and other technologies to generate reliable, accessible and useful chemical-related data.

Dr. Chakraborty stressed that scientific research should not remain confined to academic publications. Drawing on her experience of working on chemicals-related research and producing peer-reviewed publications and books, she emphasized that scientific evidence must ultimately have practical implications for society and public health. She supported the observation that accurate and comprehensive data are essential for informed decision-making and noted that further technological research, including sensor development, could strengthen chemical monitoring and assessment.

She further emphasized the importance of recognising that chemicals are essential to modern society and industry, and therefore the objective should not simply be to stop their use. Instead, stakeholders need to understand how chemicals can be handled and managed sustainably and safely. She appreciated the contributions of industry representatives and stressed that this is an important time for government, industry, researchers, civil society and other stakeholders to work collectively rather than in isolation. In her view, effective chemicals management requires collaboration across sectors and a shared responsibility for identifying practical solutions.

Dr. Chakraborty also drew attention to endocrine-disrupting chemicals (EDCs) and other less visible chemical exposures that can have serious implications for human health. She highlighted the importance of addressing chemicals that may not be immediately visible but can contribute to long-term health risks. She referred to pesticides, pharmaceuticals and industrial chemicals as important areas requiring greater attention. Her remarks underscored the need for stronger research, monitoring and public awareness regarding such chemical exposures and their potential implications for future public health.

Another important theme was the role of young researchers, students and scholars. Dr. Chakraborty appreciated their participation and contributions to the meeting and recognised that young scientists have an important role in advancing research and addressing environmental challenges. She encouraged researchers to move beyond their specialised research niches and engage more actively with stakeholders and real-world environmental and public health problems.

Technical Sessions

1:00–1:30 PM | Technical Session I – Global Framework of Chemicals: Stockholm Convention and POPs by Dr. Ramesh Kumar, Sr. Principal Scientist, CSIR-NEERI

The first technical session focused on the Stockholm Convention and India's National Implementation Plan (NIP) for persistent organic pollutants (POPs). The presentation focused on India’s National Implementation Plan (NIP) for Persistent Organic Pollutants (POPs) under Article 7 of the Stockholm Convention. The NIP explains how a country will manage, control, reduce and ultimately eliminate POPs and should not be treated as a standalone document. Its objectives need to be integrated into environmental regulations, national development policies and sustainable-development strategies. India prepared its first NIP in 2011, and the current exercise is the first major updating process, with submission expected by March 2027. A key principle highlighted was that “if you cannot measure it, you cannot manage it,” making the development of a reliable inventory a major requirement. The inventory covers production, import, export, industrial use, stockpiles, products containing POPs, waste and concentrations in environmental compartments such as air, water and soil. Several sectors are being assessed, including agriculture, automobiles, textiles, plastics, electrical and electronic equipment, construction, pulp and paper, rubber and leather and waste management. Particular attention is being given to chemicals such as PFAS, brominated flame retardants, PCBs, pentachlorophenol and UV stabilisers. The plan also addresses contaminated sites, remediation, human-health impacts and the identification of safer, technically feasible and cost-effective alternatives to hazardous chemicals.

The presentation further explained that some POPs are unintentionally generated as by-products of industrial processes and waste treatment. Therefore, the adoption of Best Available Techniques (BAT) and Best Environmental Practices (BEP) is necessary to minimise emissions of chemicals such as dioxins and furans. Implementation of the NIP involves several institutions, including MoEFCC, CPCB, State Pollution Control Boards, research institutions, laboratories, UNEP and industry stakeholders, supported by national and technical committees. Since the project began in January 2023, activities have included awareness workshops, industrial surveys, stakeholder consultations, laboratory capacity building, training of customs and pollution-control officials, sampling, chemical analysis and development of chemical inventories. Approximately 75% of the work has been completed. The industrial surveys have identified the use or presence of POP-related chemicals in

automobile, textile, electrical and electronic, construction and other sectors, while efforts are also being made to identify contaminated sites and obsolete chemical stocks requiring safe management.

Several challenges remain, including limited production and use data, difficulties in tracking imports and exports due to the absence of specific HS codes, analytical challenges in complex products and waste, concerns about the cost of alternatives, limited environmental monitoring and inadequate health-related research. Industry participation is also important because the transition away from hazardous chemicals requires technically suitable and economically viable alternatives. The major recommendations include establishing a national POPs monitoring programme, strengthening laboratory and institutional capacity, improving chemical reporting and data systems, developing appropriate HS codes, promoting safer alternatives, increasing research and epidemiological studies, strengthening public awareness and improving coordination among government, industry and research organisations. Overall, the NIP should be considered a dynamic and continuously updated framework covering the complete life cycle of POPs from production, import and industrial use to environmental release, products, waste, contaminated sites, remediation, human exposure, substitution and long-term monitoring.

1:30–2:15 PM | Lunch Break

2:15–2:50 PM | Technical Session II – Minamata Convention on Mercury – Mr. Satish Sinha

The presentation by Mr. Satish Sinha focused on the Minamata Convention, an international treaty established to protect human health and the environment from the harmful effects of mercury. Mercury is considered one of the most hazardous metals because of its toxicity, persistence and ability to affect the nervous, reproductive and other biological systems. The speaker referred to the well-known Kodaikanal mercury contamination incident, where mercury-containing waste from a thermometer manufacturing facility contaminated the surrounding soil and resulted in long-term environmental concerns and legal intervention. The site subsequently underwent remediation, demonstrating the difficulties and costs involved in managing mercury-contaminated locations.

The Minamata Convention was adopted in 2013 in Kumamoto, Japan, and India ratified it in 2018. The Convention follows two major approaches: controlling the supply of mercury and reducing the demand for mercury. On the supply side, it aims to control mercury mining, trade and availability, while on the demand side it promotes the phase-out or reduction of mercury use in products and industrial processes. The Convention establishes provisions governing the international trade of mercury between Parties and non-Part countries and provides requirements for the management, storage and disposal of mercury and mercury-containing waste.

A major component of the Convention is the phase-out of mercury-containing products. These include products such as thermometers, sphygmomanometers, certain batteries, switches and relays, fluorescent lamps, cosmetics, pesticides and other mercury-containing equipment. Countries are provided with specific timelines for eliminating or restricting these products. For India, the phase-out deadline for most covered products has been extended to 2030, while dental amalgam has a longer global timeline extending to 2034. Although alternatives to dental amalgam are available and a substantial shift towards non-amalgam dental materials has already occurred in India, the continued teaching and use of amalgam remains a concern. The speaker particularly highlighted the need to update dental education and curricula so that students are trained in safer alternatives.

One of the major gaps in India is mercury-containing waste management. Although mercury-free thermometers and blood-pressure instruments are increasingly being used, hospitals and other institutions may still have old mercury-containing equipment. There is insufficient awareness about how these products should be collected, stored, transported and safely disposed of. The problem is therefore not only replacing mercury-containing products but also managing the mercury already present in the country. Appropriate technologies for mercury

recovery, storage and disposal exist internationally, but India needs stronger systems, protocols and institutional mechanisms to implement them effectively.

The presentation also highlighted the economic and technological opportunities associated with mercury substitution. India had the technical capacity to manufacture alternatives to products such as mercury thermometers and sphygmomanometers, but insufficient industry and policy action allowed other countries, particularly China, to capture much of this market. This demonstrates that environmental regulations can also create opportunities for domestic industries to develop and manufacture safer alternatives if appropriate investment, technology and policy support are provided.

On the supply side, the Convention seeks to eliminate primary mercury mining. Countries are required to stop primary mercury mining within a specified period after ratification. The long-term objective is to prevent new mercury from entering circulation and instead safely manage mercury that is already present in products, waste and other stocks. The presentation noted that India's mercury imports have declined substantially compared with historical levels, while mercury from the chlor-alkali industry is no longer expected to represent a major stockpile because mercury was progressively transferred and consumed during the transition away from mercury-based processes.

Another important aspect of the Minamata Convention is mercury emissions and releases. Mercury can be released unintentionally from activities such as coal combustion, industrial processes and certain waste-management operations. This is particularly important for India because coal remains an important component of the country's energy system. Although completely eliminating mercury emissions from coal combustion is difficult, appropriate emission-control technologies and improved operating practices can significantly reduce releases. The Convention therefore addresses emissions to air as well as releases to water and land.

The presentation also discussed emerging concerns regarding different forms and pathways of mercury in the environment. Elemental mercury can undergo transformation in the environment, including conversion into other chemical forms that may be more readily available for biological uptake. These transformations and their environmental impacts are receiving increasing scientific and regulatory attention. There is also ongoing international discussion about mercury associated with activities such as petroleum and crude-oil processing.

A major achievement highlighted for India was the successful transition of the chlor-alkali industry away from mercury-based technology. India had numerous mercury-cell chlor-alkali plants, but these facilities were converted to alternative technologies ahead of the required deadline. The transition was considered a significant success because the newer technologies were not only environmentally preferable but also more energy efficient. India consequently became an important example internationally of how an industrial sector can successfully transition away from mercury-based production.

2:50–3:10 PM | Technical Session III- Global Framework on Chemicals & Emerging Pollutants by Mr. Piyush Mohapatra, Sr. Programme Coordinator, Toxics Link

Mr. Piyush discussed the Global Framework on Chemicals (GFC) and its importance in strengthening the sustainable management of chemicals and emerging pollutants. He explained that while many chemicals are recognized as carcinogenic, endocrine-disrupting or otherwise hazardous to human health and the environment, some chemicals such as lead continue to have important industrial applications. Therefore, chemical management should focus not only on banning substances but also on regulating their use, reducing risks and managing them throughout their entire life cycle. The GFC emerged from the Strategic Approach to International Chemicals Management (SAICM), adopted in 2006 in Dubai, after the intended 2020 targets for reducing chemical-related

risks were not fully achieved. The GFC, adopted in 2023, provides a more action-oriented approach to accelerate sound chemicals and waste management.

They highlighted several issues of concern, including lead in paints and products, highly hazardous pesticides (HHPs), endocrine-disrupting chemicals (EDCs), pharmaceutical pollutants, antibiotics, BPA, phthalates and nonylphenol. Scientific evidence and advocacy have helped bring these substances into international policy discussions. India has made progress through measures such as lead-content standards, restrictions on certain chemicals in consumer products, food-safety requirements and Extended Producer Responsibility (EPR). However, Mr. Piyush emphasized that these measures are still insufficient and require stronger implementation and coordination.

The GFC is a non-legally binding, multi-sectoral and multi-stakeholder framework covering chemicals and waste across their entire life cycle, from production and import to use, disposal and waste management. Unlike the earlier SAICM approach, it places greater emphasis on connecting chemical management with waste management and closing the life-cycle loop. Governments, industry, civil society, workers, scientists and other stakeholders are involved in its implementation. An important development is the Science-Policy Panel, which will provide scientific assessments and recommendations on chemicals of concern. This presents an important opportunity for researchers and scientific institutions to contribute evidence to future global chemical-management decisions.

Mr. Piyush also highlighted the 12 targets of the GFC, which address areas including chemical regulation, hazardous chemicals, occupational safety, human rights, chemical information and labelling, safer alternatives, waste management, circularity, highly hazardous pesticides and stakeholder cooperation. For India, these targets could have significant regulatory and trade implications, particularly where countries restrict or prohibit chemicals that may still be produced, imported or exported elsewhere. India therefore needs stronger chemical inventories, transparent information systems, appropriate labelling and internationally compatible regulatory mechanisms. Gaps in systems such as the Globally Harmonized System (GHS) can create challenges for both chemical safety and international trade.

A major theme was the development of safe, effective and affordable alternatives. Given India's large MSME sector and workforce, chemical regulations must consider technological feasibility and affordability. Mr. Piyush emphasized the importance of domestic research, innovation, technology development and investment in safer alternatives. He also identified occupational exposure, informal-sector chemical use, illegal and transboundary movement of hazardous chemicals, intellectual-property concerns and limited information on chemicals used by MSMEs as important challenges.

3.10-3.20: Technical Session III- Challenges of Industries by Mr. Kirthish Jain, LivBio

Mr. Kirthish Jain from LivBio emphasized that one of the first steps towards addressing chemical pollution in textiles is consumer education. He explained that ordinary consumers often do not understand how synthetic fibres such as polyester, nylon, spandex and other polymer-based materials are produced or what chemicals may be associated with them. Even fabrics marketed as organic or natural may contain synthetic components; for example, a fabric containing mostly organic cotton may also contain spandex and appear similar to completely synthetic material. He therefore stressed the need to explain textile materials in simple terms and improve awareness of the differences between natural, regenerated and synthetic fibres. He also noted that viscose, although derived from wood, undergoes significant chemical processing and should not automatically be considered equivalent to an untreated natural fibre.

Mr. Jain highlighted the presence of endocrine-disrupting chemicals (EDCs), particularly PFAS, across numerous consumer and industrial applications, including cosmetics, cleaning products, packaging, paints, waterproof materials and textiles. He emphasized that textiles are an important pathway for exposure because chemicals are incorporated into fabrics to provide properties such as water resistance, durability and performance. A major concern is the large gap between the number of chemicals in use and the number that have been adequately studied for human health effects. He argued that regulating only a limited number of known chemicals is insufficient because other substances with similar properties may remain unassessed and continue to enter the market.

The presentation also focused on the increasing use of synthetic and chemically treated clothing, including sportswear and innerwear. Mr. Jain questioned the growing perception that sweating is undesirable and highlighted the importance of considering how prolonged skin contact with treated or synthetic textiles may contribute to chemical exposure. Referring to the book To Die For, he discussed concerns about the potential for chemicals associated with clothing to migrate through skin, particularly where there is prolonged contact and friction. He stressed that greater attention is needed to the chemical composition of garments, especially products worn directly against the skin.

Mr. Jain further referred to the growing international concerns and litigation surrounding PFAS, noting that legal actions and regulatory developments in countries such as the United States demonstrate the long-term challenges associated with these persistent chemicals. He cautioned that phasing out hazardous substances can take many years and that India should therefore take preventive action rather than waiting for widespread evidence of harm. In the Indian context, he observed that the use of synthetic clothing is increasing and called for greater consumer awareness and access to safer alternatives. As a practical measure, he suggested choosing cotton and other safer, affordable materials wherever possible rather than expecting consumers to completely change their lifestyles.

The discussion highlighted why natural and organic fabrics struggle to compete with synthetic textiles, mainly because of cost, large-scale production and increasing consumer demand. Bamboo and banana fibres are often chemically processed into regenerated fibres such as viscose, while linen and hemp can involve more mechanical processing. The speakers also raised concerns about poor transparency in textile labelling, where terms such as “cotton rich” may not indicate 100% cotton content.

Another major concern is overconsumption and limited textile recycling, particularly for blended fabrics containing cotton, polyester and other fibres. Separating these materials remains technically difficult, and recycling often results in downcycling rather than producing equivalent-quality fibres. The discussion concluded that sustainable textiles require safer materials, transparent labelling, reduced consumption, better recycling technologies and reduced chemical exposure.

3:20–3:40 PM | Technical Session III – Dr. Paromita Chakraborty: Interlinkages between Plastics and Chemicals

Dr. Paromita highlighted the close relationship between plastics, chemicals and waste management, explaining that the plastic pollution problem extends beyond macro-, micro- and nanoplastics to the hazardous chemicals contained within plastic products. Plastic products commonly contain additives such as plasticizers, flame retardants and other chemicals that provide durability, flexibility, colour, fire resistance and other functional properties. These chemicals may be released through weathering, leaching, recycling, wastewater discharge and open burning. Some of these substances are endocrine-disrupting chemicals that can interfere with hormonal systems and contribute to long-term human and environmental exposure. Therefore, a One Health perspective is

needed to understand the combined effects of multiple chemical exposures rather than considering pollutants individually.

A major concern discussed was the end-of-life management of plastics. Improper disposal and open burning can generate complex mixtures of toxic chemicals that enter the atmosphere and subsequently contaminate soil and water, particularly during rainfall and monsoon events. Recycling also requires careful consideration because hazardous additives present in the original plastic can remain in recycled materials and enter new consumer products. Therefore, simply recycling a plastic product does not necessarily eliminate its chemical risks. The speaker emphasized the importance of understanding what materials are being recycled, what chemicals they contain and what new products are being manufactured from them.

Research presented from Indian rivers, urban environments and contaminated areas demonstrated the movement of plastic additives and other emerging contaminants through ecosystems. Plastic materials can also act as carriers for organic contaminants, allowing pollutants to move from one location to another. Studies conducted in river systems, including the Ganga and Brahmaputra regions, identified chemical fingerprints associated with plastics, wastewater and industrial activities. Some compounds were also evaluated using biological assays to understand their potential hormone-mimicking activity. The presentation further highlighted that certain pollutants are semi-volatile or persistent and can travel over long distances before depositing in colder or remote regions, making chemical pollution a transboundary and global issue.

Dr. Paromita also emphasized the difficulty of detecting emerging contaminants such as PFAS and other chemicals at very low concentrations. Such analysis requires sophisticated instrumentation, appropriate standards, validated analytical methods and rigorous quality assurance and quality control. She cautioned that the increasing number of studies on microplastics and emerging contaminants makes data quality particularly important, as unreliable or poorly validated measurements can lead to incorrect conclusions. Capacity building is therefore required not only through equipment but also through training researchers and pollution-control agencies in sampling, analytical methods, protocols and data interpretation.

The presentation also explored possible remediation and management approaches, including nanocomposite filter beds, indigenous microorganisms and constructed wetlands. These technologies can help capture or degrade micropollutants and provide short-term risk-management solutions. Another example involved using a small proportion of recycled plastic as a filler in concrete paver blocks. The approach was tested for strength and potential chemical leaching, with the recommendation that such materials be used in lower-stress applications such as garden areas rather than roads. Dr. Paromita stressed that recycled plastic products must be evaluated for their long-term stability, weathering, friction, microplastic generation and chemical release before large-scale use.

3:40–3:50 PM | Technical Session III on Global Overview of PFAS by Dr. Jitka Straková, Global Researcher, International Pollutants Elimination Network (IPEN) (Through prerecorded video)

Dr. Jitka Straková provided a global overview of per- and polyfluoroalkyl substances (PFAS), a large group of synthetic fluorinated chemicals widely recognized for their exceptional persistence in the environment. PFAS are often referred to as “forever chemicals” because many of these substances are highly resistant to natural degradation. Their chemical stability, combined with properties such as resistance to heat, water, oil and chemical degradation, has resulted in their extensive use across different industrial applications.

The presentation emphasized that PFAS have become a global environmental and public-health concern because of their persistence, mobility and potential for long-range environmental transport. They can move through environmental compartments such as air, water and soil and can ultimately enter biological systems. Some PFAS

are also capable of remaining in organisms for extended periods, creating concerns regarding long-term exposure and ecological impacts.

Dr. Straková highlighted the complexity of PFAS management due to the large number of chemicals within the PFAS family. Focusing only on individual substances may not adequately address the wider problem because related PFAS can be introduced as substitutes when particular chemicals are restricted. This creates the possibility of "regrettable substitution," where one problematic chemical is replaced by another compound with similar persistence or hazards. Therefore, a broader class-based approach to PFAS management is considered important.

The presentation also discussed the significant data and regulatory gaps between countries. While some countries have developed monitoring programmes, restrictions and risk-management measures, many developing countries continue to face limitations in scientific information, laboratory infrastructure, analytical capacity and regulatory implementation. Strengthening national monitoring and research capacity is therefore essential for identifying sources, understanding environmental transport and supporting effective policy decisions.

PFAS management also needs to be considered within the framework of international chemicals and waste policies, including the Stockholm Convention, under which certain PFAS have already been listed as persistent organic pollutants. However, the broader PFAS group remains much larger, requiring continued international cooperation and policy development.

3:50–4:15 PM | Panel Discussion – Chemicals Management in Tamil Nadu

The panel discussion, moderated by **Mr. Satish Sinha**, brought together experts with diverse perspectives from the textile industry, environmental research and aquatic toxicology. The session focused on the practical challenges of managing hazardous chemicals, industrial pollution, textile waste, environmental contamination and the protection of aquatic ecosystems. Mr. Satish Sinha invited the panelists to identify major challenges and suggest practical solutions based on their experience in research, industry and environmental management.

From the textile-sector perspective, the panel highlighted the need to improve industrial processes through modernization, automation and efficient wastewater treatment. Textile manufacturing can generate significant wastewater containing dyes, chemicals and other contaminants. The establishment and strengthening of Common Effluent Treatment Plants (CETPs) and cluster-based treatment facilities were discussed as important solutions, particularly for small and medium-sized industries that may not be able to establish and operate advanced individual treatment systems. Government support for industrial clusters can help industries adopt better treatment infrastructure while reducing the financial burden on individual units.

Another important issue was the need to reduce water consumption in textile manufacturing. Development and adoption of more efficient dyes, processes and technologies can help reduce water and chemical requirements. However, the panel recognized that the transition toward sustainable production must also consider product quality, consistency, colour fastness and the ability to reproduce processes at an industrial scale. Sustainable materials and natural dyes provide opportunities for reducing environmental impacts, but further research and technological development are required to overcome limitations related to availability, quality and large-scale implementation.

The panel also discussed the growing challenge of textile recycling, particularly because many textile products are made from blended fibres. When different fibres are combined during manufacturing, separating them at the end of their useful life becomes technically difficult and expensive. Although recycling technologies exist for materials such as polyester, producing recycled materials with consistent quality remains a challenge. The panel emphasized that the issue is not necessarily whether recycling is technically possible, but whether it is economically viable and capable of producing materials of acceptable quality for the market. Greater research and development are therefore required to improve fibre separation, recycling efficiency and the quality of recycled materials.

Consumer awareness and transparency were identified as another important component of sustainable textile management. Consumers often do not have adequate information about the fibre composition and chemical characteristics of products. Clear information regarding material composition can help consumers make more informed choices and can also support recycling by making it easier to identify and separate materials. The panel suggested that manufacturers and brands should take greater responsibility for transparency, while awareness programmes should explain the environmental implications of textile consumption, recycling and waste generation.

From the environmental research perspective, the panel emphasized that India requires much stronger and more systematic monitoring of hazardous chemicals. There are significant gaps in information regarding the types and quantities of chemicals being produced, imported, used and released across different sectors. Without reliable inventories and monitoring data, it becomes difficult for regulatory authorities to identify priority chemicals, understand the scale of contamination and allocate appropriate resources for pollution control. The discussion therefore stressed the importance of developing more detailed national and state-level chemical inventories and strengthening environmental monitoring programmes.

The panel further emphasized that monitoring should not be treated as an end in itself. Once pollutants are identified, their environmental behaviour, toxicity, persistence, transport and sources need to be understood. This information can then be used to develop appropriate control and remediation strategies. For persistent pollutants that occur at relatively low levels but may have significant toxicity, specialized treatment approaches may be required. The use of pretreatment or pre-concentration techniques was discussed as one possible approach for improving treatment efficiency and potentially reducing the energy and cost associated with subsequent treatment processes.

A major issue identified during the discussion was the gap between research institutions and real-world environmental problems. Industries and regulatory agencies frequently face practical pollution-control challenges, while researchers may be working on topics that are not directly connected to those immediate needs. The panel suggested stronger collaboration between industries, researchers, pollution-control agencies and policymakers, so that practical problems can be converted into focused research questions. Such collaboration could accelerate the development and adoption of technically feasible and economically viable environmental solutions.

The discussion from the aquatic toxicology perspective emphasized that environmental protection should not focus exclusively on human beings. Aquatic ecosystems contain complex communities of plants, microorganisms, fish and other organisms that can be affected by chemical pollution. Since water bodies and oceans can act as major sinks for pollutants, chemicals released from industrial, urban and other sources can ultimately accumulate in aquatic environments. Protecting human health therefore requires protection of the wider ecosystem and biodiversity.

An important scientific issue discussed was the effect of chemical mixtures. Environmental organisms are rarely exposed to only one chemical at a time. Multiple pollutants may occur together and can interact to produce additive, synergistic or antagonistic effects. Consequently, environmental risk assessment should increasingly consider the combined effects of chemical mixtures rather than evaluating each chemical independently. This is particularly important for aquatic ecosystems where contaminants from different sources can accumulate and interact.

The panel also highlighted the importance of ecotoxicological research and scientifically derived water-quality criteria. Such criteria are necessary for determining pollutant levels that can protect aquatic organisms and ecosystem functions. Region-specific environmental conditions may need to be considered when establishing appropriate criteria. Research involving aquatic organisms at different trophic levels can provide evidence for understanding the sensitivity of ecosystems and developing scientifically supported environmental standards.

The vulnerability of marine and coral reef ecosystems was also discussed. Plastics and microplastics can enter aquatic environments and may be mistaken by organisms for food. Once ingested, these materials can potentially affect aquatic organisms directly and may also contribute to the transfer of associated chemicals through food

webs. The discussion therefore reinforced the need to address plastic pollution not only as a waste-management issue but also as an ecotoxicological and ecosystem-health concern.

In the concluding part of the session, Mr. Satish Sinha brought together the different perspectives and identified several broader priorities for chemical management in India. He emphasized that many hazardous chemicals are already known to pose risks, and the focus should increasingly move toward effective regulation, monitoring, safer alternatives and life-cycle management, rather than repeatedly debating whether established hazardous chemicals are harmful. India needs stronger frameworks that cover chemicals from their manufacture, import and use through disposal, waste management, treatment and environmental release.

Another major recommendation was the development and promotion of safer alternatives. However, Mr. Satish Sinha pointed out that the term “safer” should be understood in a relative sense because scientific knowledge continues to evolve. A replacement chemical may initially appear safer but could later be found to have previously unknown environmental or health impacts. Therefore, alternatives should undergo continuous scientific assessment, monitoring and evaluation rather than being considered permanently risk-free.

The discussion also addressed the frequently raised issue of the cost of safer technologies and alternatives. Mr. Satish Sinha emphasized that discussions often focus on the immediate manufacturing and implementation costs, while the much larger cost of inaction is rarely included. If hazardous chemicals continue to be used without adequate controls, society may ultimately bear costs associated with environmental degradation, pollution, health impacts and remediation. These indirect and long-term costs should be incorporated into economic and policy decision-making.

The panel emphasized the importance of information, transparency and traceability. Better information about chemicals, their uses, composition, environmental releases and final disposal can help regulators, industries and consumers make more informed decisions. Consumer awareness can also create market demand for safer and more sustainable products, encouraging manufacturers to improve their practices.

Key issues raised included the need for:

- stronger monitoring of chemicals and environmental contamination;
- better treatment and management of industrial effluents;
- cluster-based approaches and common treatment infrastructure for MSMEs;
- reduced water and chemical consumption in textile processing;
- modernisation and automation of treatment systems;
- greater transparency regarding the chemical and material composition of products;
- consumer awareness regarding sustainable and recycled products;
- research and development on safer chemicals, alternative materials and treatment technologies;
- better understanding of the effects of chemical mixtures on aquatic ecosystems;
- development and application of water-quality criteria and environmental standards; and
- stronger collaboration between researchers, industry, regulators and civil society.

The textile sector perspective emphasised the challenges posed by blended materials and the need to improve product transparency and recycling technologies. The research perspective stressed the need for systematic monitoring and development of practical treatment solutions. The aquatic toxicology perspective highlighted the movement of contaminants through ecosystems, bioaccumulation and the importance of protecting aquatic flora and fauna as part of a One Health approach.

4:15–4:20 PM | Concluding Remarks – Mr. Satish Sinha

Satish Sinha summarised the day's discussion and noted that many chemicals of concern are already known to be hazardous, making the need for effective regulation and management urgent.

He identified several broad priorities: developing reliable inventories and granular data on chemical production and use; promoting safer alternatives; incorporating the 'cost of inaction' and health and environmental impacts

into economic decision-making; improving information and traceability; and communicating chemicals-related issues to the public in simple and accessible language.

He emphasised that chemicals management cannot be addressed through a single intervention. It requires a long-term process involving regulation, science, technology, industry action, consumer awareness and collaboration among stakeholders.

The meeting concluded with thanks to all participants, speakers, experts, partners, students and organising teams for their contributions and engagement throughout the day.

3. Key Takeaways

- Chemicals management needs to be treated as a cross-sectoral development priority involving environment, industry, public health, agriculture, labour, consumer protection and other departments.
- Tamil Nadu would benefit from a state-level or cluster-based approach to chemicals management, particularly for textiles, leather, chemicals, automobiles and other chemical-intensive sectors.
- Reliable data on chemical production, imports, exports, use, environmental concentrations, exposure and waste is a major gap and should be strengthened through systematic inventories and monitoring.
- The implementation of international agreements such as the Stockholm and Minamata Conventions needs stronger integration with domestic regulations, standards and implementation mechanisms.
- Safer alternatives should be promoted alongside restrictions on hazardous chemicals, with attention to technical feasibility, affordability and technology transfer.
- Research institutions and industries should collaborate more closely to translate research findings into practical solutions, particularly for monitoring, remediation, wastewater treatment and safer production.
- Product transparency and traceability are essential for consumers, recyclers and regulators, especially for textiles, plastics and electronic products.
- Chemical risks should be assessed across the entire life cycle of products, including manufacture, use, recycling and end-of-life management.
- Greater attention is needed to emerging pollutants such as PFAS, endocrine-disrupting chemicals and persistent chemicals in recycled products.
- Capacity building of regulators, laboratories, industry, MSMEs, researchers and communities is essential for effective chemicals management.