Accelerating action

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Implementation Programmes

Work Area: Integrating sound chemicals and waste management in sustainable development decision-making processes ("IP3")

Title of document: Integrating the Sound Management of Chemicals and Waste in Education Policies and Programmes (*draft)*

About this document:

This draft primer aims to support the achievement of Target B5 "By 2030, educational, training and public awareness programmes on chemical safety, sustainability, safer alternatives and the benefits of reducing chemicals and waste risks have been developed and implemented, taking into consideration a gender-responsive approach. , as agreed in the Global Framework on Chemicals (GFC). To this end, all stakeholders in the field of education and chemical safety are called upon to work together to incorporate chemicals and waste management considerations into formal and informal education activities. To achieve this, it also encourages the international chemicals and waste community to actively engage with education authorities and programmes. A GFC Implementation Programmes may provide an institutional mechanism that can support leadership and kick start collaboration in this area.

This draft document has been developed by the IOMC to support the implementation of ICCM-5 Resolution V/8, which encouraged "Integrating sound chemicals and waste management in sustainable development decision-making processes, as appropriate" as an area of work for possible implementation programmes. While the IOMC does not intend to propose a specific Implementation Programme on this topic, the draft primer may serve as a starting point for stakeholders interested in advancing the topic further. GFC stakeholders interested in taking this work forward are encouraged to contact: Oliver Wootton (Oliver.WOOTTON@unitar.org)

Integrating the Sound Management of Chemicals and Waste in Education Policies and Programmes

A primer to support sustainable development

DRAFT

November 2026

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1 About this Primer

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2 Why Integrate Chemicals and Waste Management into Education?

2.1 The Sustainable Development Context

Education plays a critical role in building the knowledge, skills, and values necessary for safer production, use, and disposal of chemicals, and through this help to achieve broader sustainable development goals, such as those addressing health, clean water, responsible consumption and production, climate action, and ecosystem protection. Integrating chemicals and waste management issues into education systems and activities helps ensure that future professionals, workers, policymakers, and citizens have the knowledge and skills necessary to minimizing environmental and health risks associated with hazardous chemicals and wastes. Education is also crucial for advancing green and sustainable chemistry innovation, safer chemical design, and sustainable resource management, and circular economies.

2.2 Current Global Situation

While global production and use of chemicals continue to grow, often with negative impacts on human health and the environment, education and training on key aspects of chemicals and waste management remain uneven. Many education programmes and curricula in formal education institutions include only limited content on toxicology, environmental toxicology, chemical safety, waste management and green and sustainable chemistry. Professional training programmes often address these topics only within specialized disciplines, leaving important knowledge gaps across many sectors.

2.3 Consequences of Policy Separation

As a result, decision-makers, consumers, workers, and researchers often lack sufficient knowledge about chemical hazards, risk management, safe handling practices, and innovation opportunities. This education gap is one factor for prevailing unsafe practices, environmental contamination, and missed opportunities for innovation in safer and sustainable materials. Strengthening education systems is therefore essential to build the human capacity required to achieve the sound management of chemicals and waste.

2.4 Benefits of Integrated Action

Integration of chemicals and waste management into formal, non-formal, and informal education can generate immediate benefits across different learner groups. For example:

- **Primary and secondary students** can develop early awareness of chemical safety, responsible consumption, and waste reduction practices that influence behaviour in households and communities.
- **Technical and vocational education and training (TVET) students** can acquire practical skills for the safe handling, storage, and disposal of chemicals and waste in workplaces, reducing occupational risks and environmental contamination.
- **Undergraduate and graduate students** can develop the scientific, technical, and policy expertise needed to advance green and sustainable chemistry, safer materials, and circular economy solutions.
- **Non-formal and informal learners and the public in general** can develop awareness of chemical safety, responsible consumption, and waste reduction through community initiatives, public awareness campaigns, media, and other learning opportunities outside formal education systems, helping promote safer and more sustainable practices in households and communities.

3 Specific Sub-Topics, Policy Options and Financing

3.1 Core Education Topics

Education programmes can incorporate chemicals and waste management through several thematic areas:

- **Foundations of chemicals and waste management**: basic concepts, chemical hazards, environmental impacts, and safe handling practices.
- **Sustainable development linkages**: connections between chemicals management, climate change, biodiversity protection, and sustainable consumption and production.
- **Safe handling, storage, and disposal**: practical guidance for laboratories, workplaces, and households.
- **Waste prevention and circular economy approaches**: recycling, resource efficiency, and sustainable material management.
- **Green chemistry and innovation**: safer alternatives to hazardous substances and sustainable chemical design.
- **Emerging issues**: microplastics, electronic waste, and new chemical risks associated with technological change.

3.2 Target Learner Groups

Effective integration requires addressing multiple learner groups throughout the education system:

- **Primary and secondary students**: introducing basic awareness of chemical safety, environmental protection, and responsible waste behaviour.
- **Technical and vocational education and training (TVET) students**: building practical skills for safe chemical handling, occupational safety, and waste management in sectors such as agriculture, manufacturing, construction, and healthcare.
- **Undergraduate students:** providing interdisciplinary knowledge linking chemistry, environmental science, engineering, health, and policy.
- **Graduate and master's level students**: developing advanced expertise in areas such as risk assessment, sustainable chemistry, regulatory frameworks, and policy integration.
- **Professional and lifelong learning audiences**: including teachers, regulators, industry professionals, and public officials who require continuous training to keep pace with evolving chemical risks and technologies.

3.3 Policy Options

Governments and education authorities can promote integration through several policy instruments.

- **Teacher training and capacity building**: ensuring educators have the knowledge and tools to teach chemical safety and sustainability topics.
- **Partnerships with industry and research institutions**: enabling practical learning, internships, and applied research projects.
- **Support for interdisciplinary education**: linking chemistry, environmental science, economics, and public policy to address complex sustainability challenges.
- **Public awareness initiatives**: strengthening informal learning through community programmes, media campaigns, and citizen science activities.
- **Curriculum development:** incorporating chemicals and waste management topics into science, environmental studies, engineering, and public health programmes.

3.4 Financing Options

Financing for educational integration may come from national education budgets, environmental programmes, international development assistance, and partnerships with industry and research institutions.

Investments may support curriculum development, teacher training, laboratory infrastructure, educational materials, and research programmes focused on sustainable chemistry and waste management. International funding mechanisms and development partners can also support capacity building in developing countries.

4 From Analysis to Action: Stakeholder and Institutional Engagement

4.1 National Level

National education authorities, environmental ministries, chemicals management bodies, and industry regulators can collaborate to integrate chemicals and waste topics into national education systems.
Possible actions include:

- Developing guidance materials and teaching resources.
- Reviewing and adjusting teacher training programmes.
- Promoting collaboration between universities, research institutes, and industry.
- Encouraging student research and innovation in sustainable chemistry and circular economy solutions.
- Reviewing existing curricula to identify gaps in chemicals and waste education.

4.2 Engaging International Education Stakeholders

International organizations, scientific networks, and multilateral initiatives could serve as a vehicle to support the integration of chemicals and waste management into education systems by providing and sharing guidance, teaching materials, and capacity-building programmes. For example, UNESCO promotes sustainability learning through Education for Sustainable Development (ESD) initiatives, which provide an entry point for incorporating chemicals and waste topics into school curricula and teacher training. Scientific bodies such as International Union of Pure and Applied Chemistry (IUPAC) support university education through green chemistry education initiatives, curriculum resources, and international chemistry education projects.

Training programmes and education materials of international organizations, including those participating in the IOMC, could be used to support universities, technical training institutions, and policymakers. Through such collaboration, countries can access global expertise, share good practices, and strengthen education and training on chemical safety and sustainable waste management.

4.3 Considerations for a Possible GFC Implementation Programme

A GFC Implementation Programme could empower relevant stakeholders to increase efforts to integrate chemicals and waste management into education systems and activities. Work could start with establishing an international knowledge and collaboration network connecting chemicals and waste policymakers with educators, universities, scientific organizations, and industry to exchange good practices, develop joint projects, and support curriculum development.

Possible further activities may include:

- **Develop practical guidance** for education authorities on integrating chemicals and waste management into national curricula, including examples of learning objectives and competency frameworks for different learner groups (schools, TVET, universities, and professional training).
- **Develop and disseminate teaching modules and open educational resources**, including case studies, laboratory exercises, and digital learning tools on topics such as chemical safety, waste prevention, green chemistry, and circular economy practices.
- **Support teacher training and professional development programmes**, including workshops, online courses, and training materials to strengthen educators' capacity to teach chemicals and waste management topics effectively.
- **Promote interdisciplinary research and innovation**, particularly at undergraduate and graduate levels, linking chemistry, environmental science, engineering, public health, and policy to advance sustainable and safer chemical solutions.

Exploring stakeholder interest

Taking into account that education is mentioned in the GFC, interested stakeholders may consider the value of developing an Implementation Programme on this topic. Relevant stakeholders may include GFC stakeholders, international education organizations, industry and scientific bodies. If of interest, a draft workplan and TOR could be developed for possible consideration and adoption at the International Conference.