

Management Strategies for Single-Use Plastics: Lessons to Learn from Indian Approach of Minimizing Microplastic Waste

Surya Singh¹, Mrinal Kanti Biswas^{2*}

¹Division of Environmental Monitoring and Exposure Assessment (Water & Soil), ICMR –
National Institute for Research in Environmental Health, Bhopal – 462 030, India

Email: suryasingh.nireh@icmr.gov.in

ORCID Id: 0000-0001-5981-2343

²Central Pollution Control Board, Regional Directorate, Kolkata – 700 107, India

Email: biswasmrinal@gmail.com; mkbiswas.cpcb@nic.in

ORCID Id: 0000-0002-4192-052X

*Corresponding author email: biswasmrinal@gmail.com; mkbiswas.cpcb@nic.in

SUPPLEMENTARY INFORMATION

Table S1 Roles, responsibilities, and enforcement powers of CPCB, SPCBs / PCCs, and ULBs in the context of SUP management in India

CPCB*	SPCBs / PCCs*	ULBs*
Authority for formulating SUP ban along with MoEF&CC	Authority to issue public notice for SUP ban	Authority for publicizing and disseminating awareness about the SUP ban
Supply side interventions for implementing SUP ban		
(i) Stopping supply of plastic raw material		
Authority to ensure that suppliers/ stockists/dealers and other entities engaged in the industry's supply chain do not supply plastic raw material to producers engaged in production of banned SUP items	Authority to monitor compliance	--
Authority to impose environmental compensation (EC) upon violation	--	--
(ii) Stopping manufacturing of banned SUP items		
To identify producers in informal sector, engaged in banned SUP production, through contact tracing / public notice / public grievance reporting <i>etc.</i> and initiating action against them including imposition of EC	--	--
Demand side interventions for implementing SUP ban		
Stopping usage of banned SUP items		
--	Authority to ensure that concerned ULBs inspect and identify stockists/ retailers/ sellers of banned SUP items and take action upon violation	District-wise identification of major stockists/ retailers/ sellers of banned SUP items and cancellation of commercial licenses upon violation
--	--	Preparation of bye-laws to collect fines from

		the local retailers or street vendors selling or providing commodities in plastic carry bags or multilayered packaging or plastic sheets or covers made of plastic sheets which are not manufactured or labelled or marked in accordance with these rules
Creation of enabling environment for phasing out SUPs		
Promotion of alternatives to SUP		
Authority to deliberate with industries and experts to facilitate shifting towards alternatives of SUP	Authority to deliberate with industries and experts to facilitate shifting towards alternatives of SUP	--
Upgradation of online portal (<i>viz.</i> Compostable plastics – E-certification) for issuance of certificate for compostable plastics	--	--
Formulation of protocol for testing of new alternatives to plastics	--	--
Creating awareness on phasing out of SUP	Creating awareness on phasing out of SUP	--
Authority for carrying out review of technologies related to plastic packaging and plastic waste management for techno-economic viability and feasibility	--	--
Management of SUP packaging waste and SUP legacy waste		
EPR framework		
Authority for formulating EPR framework along with MoEF&CC	Authority for publicizing and disseminating awareness about the EPR framework	Authority for publicizing and disseminating awareness about the EPR framework
Development of EPR centralized portal for the registration as well as for filing of annual returns by producers (P), importers (I), and brand owners (BO) <i>viz.</i> PIBOs; and plastic waste processors (PWPs)	--	--

Authority for registering PIBOs and PWPs operating in more than two states	Authority for enforcement of the provisions of SUP management rules onto the PIBOs; and PWPs operating only in their respective states or two states, relating to registration, manufacture of plastic products and multilayered packaging, processing and disposal of plastic wastes.	--
Authority for laying down guidelines about imposition and collection of environment compensation on PIBOs, recyclers, and end of life processors, in case of non-fulfilment of obligations	--	--
Authority for levying environmental compensation on the PIBOs operating in more than two states with respect to non-fulfilment of their EPR targets, responsibilities and obligations	Authority for levying environmental compensation on the PIBOs operating in their jurisdiction with respect to non-fulfilment of their EPR targets, responsibilities and obligations	--
Authority for verifying compliance of PIBOs / PWPs through inspection and periodic audit	Authority for verifying compliance of PIBOs / PWPs operating in their jurisdictions through inspection and periodic audit	--
Authority to establish a mechanism to ensure a regular dialogue between relevant stakeholders involved in the fulfilment of EPR obligations for plastics	Authority to establish a mechanism to ensure a regular dialogue between relevant stakeholders involved in the fulfilment of EPR obligations for plastics	--
Authority for carrying out a compositional survey of collected mixed municipal waste to determine the share of plastic waste as well as different categories of plastics packaging material on a half-yearly basis.	Authority for carrying out a compositional survey of collected mixed municipal waste to determine the share of plastic waste as well as different categories of plastics packaging material on a half-yearly basis.	--
--	Authority for submitting annual report on EPR portal with respect to fulfilment of EPR by PIBOs and PWPs in the State/Union Territory to CPCB	--

*CPCB: Central Pollution Control Board; SPCBs: State Pollution Control Boards; PCCs: Pollution Control Committees; ULBs: Urban Local Bodies

Table S2 Obligations of producers, importers, and brand owners (Plastic Waste Management (Amendment) Rules 2022)

Obligation for recycling				
Minimum level of recycling (excluding end of life disposal) of plastic packaging waste (% of EPR target)				
Plastic packaging category*	2024 – 25	2025 – 26	2026 – 27	2027 – 28 & onwards
Category I	50	60	70	80
Category II	30	40	50	60
Category III	30	40	50	60
Category IV	50	60	70	80
Obligation for use of recycled plastic content				
Mandatory use of recycled plastic in plastic packaging (% of plastic manufactured / imported for the year)				
Plastic packaging category*	2025 – 26	2026 – 27	2027 – 28	2028 – 29& onwards
Category I	30	40	50	60
Category II	10	10	20	20
Category III	5	5	10	10
Obligation for reuse[#]				
Minimum obligation to reuse for Category I (% of Category I rigid plastic packaging in products sold annually)				
Plastic packaging category	2025 – 26	2026 – 27	2027 – 28	2028 – 29& onwards
Category I rigid plastic packaging with volume / weight \geq 0.9 L or kg but $<$ 4.9 L or kg, as the case may be	10	15	20	25
Category I rigid plastic packaging with volume / weight \geq 4.9 L or kg	70	75	80	85
Obligations for end of life disposal				
(i) Only those plastics, which cannot be recycled will be sent for end of life disposal, such as road construction, waste to energy, waste to oil, cement kilns (for co-processing) <i>etc.</i> as per relevant guidelines issued by the authorities.				
(ii) The producers / importers / brand owners shall ensure end of life disposal of the plastic packaging waste only through the methodologies specified in PWM Rules, 2016.				

*Category I: Rigid plastic packaging

Category II: Flexible plastic packaging of single layer or multilayer ($>$ 1 layer with different types of plastic), plastic sheets or like, and covers made up of plastic sheet, carry bags, plastic sachet or pouches

Category III: Multilayered plastic packaging (at least one layer of plastic and at least one layer of material other than plastic)

Category IV: Plastic sheet or like used for packaging as well as carry bags made of compostable plastics

#Only for brand owners (BOs)



(a)



(b)

Fig. S1 Snapshot of (a) SUP grievance redressal application and (b) SUP portal developed by CPCB

(Image Source: CPCB)

