CHAPTER 04

POSSIBLE BUSINESS MODELS FOR PV WASTE MANAGEMENT IN INDIA

This Chapter outlines different overall policy approaches for PV waste management in India, providing an overview and comparison of the options available. It describes in detail a range of EPR policies, instruments and measures, as well as possible settings with regard to roles and responsibilities, as well as to free riding, orphan and existing products. An overview of costs is also included. Lastly, this Chapter provides a few recommendations to policymakers on how to set up and EPR system.

This section explores EPR schemes of PV modules only. Other products within a PV system such as inverters and batteries can easily be added to the programme, since these are attractive products in the waste phase due to the value of the materials in these products, whereas the value of end-of-life PV modules is lower as they are mainly composed of glass.

A general overview of possible business models, EPR scheme options and financing options for the EPR scheme as well as for addressing orphan and existing products is provided below.

Table 16 – Overview of possible business models, EPR scheme options and financing options. Source: own elaboration.

Overall policy approach						
BAU		BAU+			EPR	
EPR scheme options						
Take-back requirements	Economic instruments				Performance standards	Other
Product take-back	Deposit/ refund	Advance disposal fee	Product/ material tax	Combined upstream tax/subsidy	Minimum recycled content requirement	Industry-based measures, government measures
EPR financing options						
Internalisation of waste management costs				Visible fee		
EPR financing options						
Advance disposal fees	Fees paid at the time of purchase	Last owner pays	Insurance		Phase-in	

4.1. Overall policy approaches for PV waste management

Three overall policy approaches are outlined:

A) a business-as-usual scenario, maintaining the current status quo;

B) an improved business-as-usual scenario, whereby a landfill ban is introduced but the end-owner retains end-of-life management responsibility;

C) an Extended Producer Responsibility scenario, whereby, on top of a landfill ban, the producer has legal responsibility over the end-of-life management of the product. The options are described in more detail below.

A. BUSINESS-AS-USUAL

This means to maintain the current situation whereby:

- the end-owner of the waste has to organize the waste management at the time the waste is generated, at his own costs;
- no financing is set up for the waste management of PV modules for the past, the present and the future;
- risk of uncontrolled landfilling exists;
- there is no control nor monitoring of how the waste is treated;
- overall, PV waste management is poor.

B. BUSINESS-AS-USUAL PLUS

This means to adjust the current situation whereby:

- the end-owner of the waste has to organize the waste management at the time the waste is generated, at his own costs;
- no financing is set up for the waste management of PV modules for the past, the present and the future;
- a landfill ban is introduced for PV modules;
- control and monitoring are done by the State Pollution Control Board (SPCB) through the reported data from waste treatment facilities;
- overall, the PV waste management situation is improved, but with limited results.

C. EXTENDED PRODUCER RESPONSIBITLITY

This means the introduction of a Responsibility towards the "Producer", defined as the "first one putting the PV module on the territory of India", whereby:

- The producer is responsible for the waste management at the time the product is placed on the market; waste management is carried out collectively through the setup of one Producer Responsibility Organization (PRO) for PV modules managed and steered by the Indian PV industry; individual Extended Producer Responsibility is allowed as long as this is under the same conditions as for a PRO;
- financing is secured at the time of putting the PV module on the market, covering present and future PV waste management costs; moreover, financing for the past can be foreseen through a staggered approach;
- a landfill ban is introduced for PV modules;
- Control and monitoring are organized by the SPCB and/or Ministry of Environment/ Renewable Energy through the PRO or the Individual Producer; moreover, regular reporting on the sold amounts of PV modules and on the amounts of waste PV modules collected is carried out;
- Overall, the PV waste management is high.

A comparison of the three policy approaches is available in Table 17.

Table 17 - Comparison of overall policy approaches for PV waste management in India. Source: own elaboration.

	BAU	BAU+	EPR
Legal responsibility	End-owner	End-owner	Producer
Financing present waste management	no	no	yes
Financing future waste management	no	no	yes
Financing past waste management	no	no	possible
Landfill ban	no	yes	yes
Waste control and monitoring	no	SPCB	SPCB through PRO
Overall waste management	poor	intermediate	high

Compared to a BAU scenario or to an improved BAU scenario whereby a landfill ban is introduced, the authors of this study recommend the Extended Producer Responsibility approach as the best one for the Indian context, as it constitutes the most effective means to perform sound PV waste management. It is advised to implement an EPR law for PV modules which sets the principle of a Producer Responsibility for PV modules and – where required – other products of a PV system, such as inverters and batteries.

4.2. Introduction to EPR business models for PV waste management

Over the last few decades, many countries have actively implemented policies and programmes to reduce pollution and waste generation. Yet, environmental pressures are still increasing. At the same time, the difficulty of siting new waste disposal facilities has increased. Regulations on landfills and incinerators have strengthened and the cost of waste management has risen. The NIMBY syndrome (Not In My Back Yard) reflects the growing concern of the public regarding waste as an aesthetic problem as well as a risk to human health and the environment. In addition, the tightening of disposal options has placed an emphasis on options for reducing waste and increasing reuse and recycling.

Faced with the increase of waste, many governments have reviewed available policy options and concluded that there was a need to apply new instruments to address this problem, including placing the responsibility for the post-consumer phase of certain goods on producers. Extended producer responsibility (EPR) is a policy approach in which producers accept significant responsibility (financial and/or physical) for the treatment or disposal of post-consumer products. Assigning such responsibility could provide incentives to prevent wastes at source, promote environmentally compatible product design and support the achievement of public recycling and materials management goals.

The OECD defines EPR as an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle. There are two related features of EPR policy: (1) the shifting of responsibility (physically and/or economically; fully or partially) upstream toward the producer and away from municipalities, and (2) to provide incentives to producers to incorporate environmental considerations in the design of their products.

EPR programmes can be best understood as changing the traditional balance of responsibilities among the manufacturers and importers of consumer goods, consumers and governments with regard to waste management. Although they take many forms, these programmes are all characterized by the continued involvement of producers and importers with commercial goods at the post-consumer stage. EPR extends the traditional environmental responsibilities that producers and importers have previously been assigned (i.e. worker safety, prevention and treatment of environmental releases from production, financial and legal responsibility for the sound management of production wastes) to include the management of their products at the post-consumer stage.

Allocating responsibility and determining who is the producer are two of the most important policy design issues. This Chapter is intended to make information available to the Indian Government on EPR issues and benefits and on the actions required to establish effective EPR

policies and programmes. It examines various issues and framework conditions related to the design of EPR policies and programmes. Where possible, it draws on experience to date, as well as attempting to guide government policymakers with regard to relevant conceptual issues. It provides guiding principles and lists of questions for decision-makers to help them as they make their decisions about EPR. A list of policy recommendations is provided at the end of this Chapter.

4.3. EPR policies and considerations

4.3.1 Introduction

EPR has been recognized by most countries as a policy approach that can provide incentives to reduce the amount of post-consumer waste going to final disposal. However, in order to realize the benefits of EPR, a number of considerations should be taken into account to ensure that the policy yields the desired effect in the areas it addresses. Effective policy design will depend on the national circumstances, conditions, the market and priorities. Therefore, this Section discusses how the policy context and other factors can influence the design and outcome of EPR. It also provides a set of principles to guide policymakers when they establish EPR policy.

While the promotion of market-driven solutions is generally the preferred approach, this section attempts to provide government decision-makers with information that can help them decide on the direction and approach most appropriate for application in India. Product characteristics, markets, and intra-firm relations all affect the selection of an EPR instrument.

4.3.2 Guiding principles for EPR

The following guiding principles for the design and development of EPR policies and programmes emerged from assessing multiple EPR-programmes worldwide. These principles underline the development of effective EPR policies and programmes.

EPR policies and programmes should be designed to provide Producers[20] with incentives to incorporate changes upstream at the design phase in order to be more environmentally sound.

Policies should stimulate innovation by focusing more on results than on the means of achieving them, thus allowing producers flexibility with regard to implementation.

Policies should take into consideration a life cycle approach in order environmental impacts are not increased or transferred somewhere else in the product chain.

[20]Under the European WEEE Directive a "Producer" is the natural or legal person established in the country and which manufactures and sells or which imports and distributes brands of products or which purchases OEM products and sells these under his own name or brand in the country; the Producer can also be established outside the country when the Producer is the owner of an online webshop which sells directly to residential or B2B-end customers in the country.

Responsibilities should be well defined and not be diluted by the existence of multiple actors across the product chain.

The unique characteristics and properties of a product, product category or waste stream should be factored into policy design. Given the diversity of products and their different characteristics, one type of programme or measure is not applicable to all products, product categories or waste streams.

The policy instrument(s) selected should be flexible and chosen on a case-by-case basis, rather than setting one policy for all products and waste streams.

Extension of producer responsibilities for the product's life cycle should be done in a way to increase communication between actors across the product chain.

A communication strategy should be devised to inform all the actors in the product chain, including consumers, about the programme and to enlist their support and co-operation.

To enhance a programme's acceptability and effectiveness, a consultation of stakeholders should be conducted to discuss goals, objectives, costs and benefits.

Local governments should be consulted in order to clarify their role and to obtain their advice concerning the programme's operation.

Both voluntary and mandatory approaches should be considered with a view on how to best meet national environmental priorities, goals and objectives.

A comprehensive analysis of the EPR programme should be made (e.g. which products, product categories and waste streams are appropriate for EPR, whether historical products should be included, and the roles of the actors in the product chain).

EPR programmes should undergo periodic evaluations to ensure that they are functioning appropriately and are flexible enough to respond to these evaluations.

Programmes should be designed and implemented in a way that environmental benefits are obtained while domestic economic dislocations are avoided.

The process of developing and implementing EPR policy and programmes should be based on transparency.

It is relevant to highlight that under an EPR approach, it is not the government's role to control, monitor and regulate the producer or the PRO. If the EPR scheme is properly designed, these actors will have an incentive to achieve targets and goals set out in the waste legislation and will self-regulate themselves. Producers will take independently decisions around the design, implementation, execution, control and monitoring of the scheme. In contrast, the role of the government is to ensure that there is an effective legal framework in place for waste management and to set and review waste management targets and goals.

4.3.3 Goals and objectives

One of the most important steps in designing an effective EPR scheme is the establishment of clear policy goals and program objectives. Goals should be transparent and established in relation to specific environmental improvements, such as biodiversity, natural resource preservation or conservation, and energy conservation. The list below is not comprehensive.

There are four principal goals for EPR:

- Source reduction (natural resource conservation/materials conservation).
- Waste prevention.
- Design of more environmentally compatible products.
- Closure of materials use loops to promote sustainable development.

A good example of goals used in countries is Germany, where EPR is a cornerstone of the national goal of a closed loop economy. In the Netherlands, EPR is one of the policies used to help meet the national environmental goals of maintaining space (quality and quantity - referring to waste management issues), biodiversity and energy conservation.

A number of objectives for EPR policies can help meet stated policy goals. In this section an objective is viewed as a specific action or tactical step toward the policy goal. The objective(s) selected will vary depending on the type of product or product category, waste stream or sector to be addressed, as well as national priorities, conditions and circumstances.

Examples of possible objectives for EPR policies include, inter alia:

- reducing use of [particular] natural resources;
- reducing use of [specified] raw materials;
- reducing use of certain toxic substances and/or other potential hazardous components;
- reducing littering;
- reducing the spread of incinerators and their pollution;

- reducing the spread of landfills and their pollution;
- reducing the amount of waste going to final disposal (i.e. landfill);
- reducing energy use;
- financing a portion of waste management costs;
- internalizing costs of waste management (or other externalities) into the price of the product;
- increasing reuse and recycling of products;
- increasing the recycling of materials to retain their maximum value;
- creating an organized system for collecting specific products, product groups or waste streams;
- reducing waste management costs to taxpayers;
- reducing the costs of waste management borne by municipalities;
- developing cleaner production and products, which can include:
    - incentives for more environmentally compatible products;
    - products with less toxic and/or hazardous compounds;
    - developing new recycling techniques and capacity; or
    - improving materials management.

In setting goals and objectives, a number of issues affecting the nature, operation and results of EPR policies should be taken into account. These include defining the programme's terms and scope, setting targets or quotas, and identifying the roles and relationships of other laws and regulations already in place. The following sections address these points.

4.3.4 Defining terms

Terms such as producer, final product, recovery, recycling and distribution chain need to be clearly defined from the start. Therefore, the Government can rely on the knowledge at – inter alia – the Ministry of Environment.

4.3.5 Scope

The scope of an EPR programme should be considered in relation to stated goals and relative objectives. The types of products, product groups, waste streams and/or sectors to be addressed need to be determined since they can greatly affect how a programme should be

designed and developed. Without a clear and concise definition of scope, many issues, such as the complicated mix of product characteristics, can affect the allocation of responsibilities and the clarity of the roles of those affected by a policy.

4.3.6 Legal and administrative approaches

There is a continuum of approaches for implementing EPR – from fully voluntary to mandatory. Policymakers contemplating EPR will need to decide early on whether to make the programme voluntary or mandatory or to use a combination of the two (e.g. negotiated agreements or covenants). While particular EPR instruments and measures are discussed in Section 2, the following paragraphs provide an overview of approaches for decision-makers to bear in mind.

4.3.6.1 Mandatory approaches

Many countries have used legal mechanisms (such as regulations and ordinances) for implementing EPR programmes. Decisions on whether to pursue a mandated programme should be made vis-à-vis the EPR policy, goals and national environmental priorities. Governments considering the establishment of a mandatory programme must first identify whether appropriate authority (e.g., waste agency) exists. If not, the enabling legislation, regulation or ordinance would need to be developed. Additionally, under a mandatory programme, a formal oversight role may be needed and provisions for sanctions would be necessary to ensure compliance. Also, the costs of implementing a mandatory programme could be significant and should be evaluated.

4.3.6.2 Voluntary approaches

Voluntary approaches are a category of environmental policy instruments, covering a wide variety of arrangements. They range from industry-based to government-based initiatives and include:

- unilateral commitments by industry;
- agreements achieved through direct bargaining between polluters and pollutees;
- agreements negotiated between industry and public authorities;
- voluntary programmes developed by public authorities to which individual firms are invited to participate.

A pervasive use of voluntary approaches can be observed in several countries. Negotiated agreements like the Dutch Packaging Covenant or the Flat Glass Take-back programme are well known. Increasingly, company specific or sector-wide unilateral commitments are emerging in the area of EPR, especially with product take-back. The motivations behind these programmes can include economic drivers to recover high-value items, public relations gestures, means to avoid government intervention, or means to secure greater market share. Often such programmes result in reduced resource and energy consumption, reduced operational costs,

and increased credibility with shareholders and the public. The Responsible Care programme embodies the concept of product stewardship and is a well-known example of a multilateral (voluntary) commitment made by the chemical industry in many countries.

Recently, more and more industry-based initiatives like product stewardship (which often includes product take-back) and take-back have emerged. An evaluation of the drivers for these programmes and their expansion under certain product categories can provide valuable insights to decision-makers considering EPR.

4.3.7 Targets and quotas

Targets for recycling and quotas for the take-back of products are found in most currently operating EPR programmes. This mechanism can be critical when the objectives are, for example, to increase reuse or recycling rates or to reduce the amount of waste going to final disposal. Targets and quotas, which could be quantitative and/or qualitative, might include recycling or recovery rates, performance quotas or specific quality objectives. Consultations with affected and interested parties can help increase the acceptability of targets by the public, industry, and all levels of government.

Specific considerations to take into account when setting targets include:

- Who is involved in setting the target? (e.g. stakeholders).
- Will the target be voluntary or mandatory?
- What is the time for meeting the target? Will there be a phase-in period?
- What would happen if the target is not met in the established time period?
- Are baseline data available to measure the target against?
- What is the capacity of the market to meet set targets or quotas?

4.3.8 Matching supply and the capacity to manage the demand for recyclables

The public response to the German Packaging Ordinance was such that the initial targets were significantly overachieved. German secondary materials markets became saturated, and the excess material was “dumped” on the international market at below-market prices. The key issue was that the capacity and technical capability available to handle all the secondary materials did not fully exist when the Ordinance came into force. Over time, this market failure has corrected itself and decision-makers took away the lesson that national capacity and the capability to recycle secondary materials need to be scrutinized before setting targets and quotas.

The development of new recycling capacity requires time and investment, and governments may wish to introduce specific targets and quotas on an incremental basis to ensure that there is adequate time for the market to react to any unanticipated impacts. In order to avoid inhibiting innovation and perhaps stifling recycling capacity, care should be taken not to set

targets at arbitrary rates or shift the focus from longer-term changes to shorter-term fixes. In order to avoid such negative effects, one option could be to establish a phased-in schedule of targets or quotas to help build capacity and technical capability over time. Decision-makers might also want to establish a public awareness program concerning the targets and what they mean.

4.3.9 Roles and relationships of national and sub-national environmental goals, programmes and laws

In developing EPR policies, decision-makers should review how they would interact with and support national environmental priorities and objectives. As part of this review, it is necessary to assess environmental policies and laws to evaluate the current situation and to ensure that no conflicts exist with proposed EPR policies and programmes or with other national and sub-national laws (including trade and competition). At this stage, decision-makers may wish to take stock of current industry-based voluntary initiatives and local programmes as they consider whether intervention is necessary or where best to intervene. For those who are considering a mandatory approach, it would be prudent to assess the current legal structure to identify whether appropriate authority exists, whether a new law, regulation or ordinance would have to be created, or if adjustments to current regulations can be made.

4.3.10 Internalization of costs

A major obstacle in achieving sustainable economic development arises from the presence of external environmental costs. The OECD Council Recommendation on the Use of Economic Instruments in Environmental Policy from 1991 states that sustainable and economically efficient management of environmental resources requires the internalization of pollution prevention and control and damage costs. The importance of internalizing costs as clearly acknowledged in this Act, is a fundamental aspect of environmental policy design. Within the context of EPR, the extension of the producer's responsibility could explicitly lead to a substantial internalization of social costs for treatment and disposal. It could also implicitly correct other environmental impacts along the life cycle, not currently reflected in the final product price.

4.3.11 Participation of actors in the product chain - sharing responsibilities and setting targets

Part of the EPR debate concerns the concept of shared responsibility – or more explicitly, whether a producer should have primary responsibility under EPR. Sharing responsibilities across the product chain is an inherent part of EPR. While the policy mechanism is called Extended Producer Responsibility, it should be borne in mind that all actors in the product chain and in society must participate in order to optimize its effects. However, sharing responsibilities is a delicate aspect of EPR. All actors, including consumers, have an important role to play in effectuating EPR policy. Similarly, the co-operative nature implicit under EPR requires careful planning and communication among all affected and interested parties in the product chain.

Goals, objectives, and the type of policy instrument selected will dictate the allocation of responsibility (see also under Section 3 below). Regardless of the EPR mechanism selected, effective EPR implementation depends on the participation of all the actors in the product chain; they are all responsible in some way or other for the environmental externalities. The challenge for governments is to design their policies and programmes so that responsibility is appropriately shared without diminishing the incentives placed on producers to reduce the product's environmental impacts at the post-consumer phase.

4.3.12 The Polluter-Pays Principle

In 1972, the OECD enshrined the Polluter-Pays Principle (PPP) as the overarching economic and social principle with regard to promoting efficient resource allocation for environmental protection while avoiding distortions in international trade and investment.

The Polluter-Pays Principle states that the polluter should bear the expenses of preventing and controlling pollution to ensure that the environment is in an acceptable state, irrespective of whether these expenses are incurred through a charge on pollutant emissions or in response to direct regulation. Nearly 30 years of environmental regulations are based on the PPP.

Depending upon the nature of the market structure and inter-firm relationships, environmental policies applied at the level of the externality may not always achieve their environmental objective. Moreover, in the case of waste generation, the administration costs associated with targeting waste flows with different environmental impacts may be excessive due to the complex nature of household waste.

EPR, on the other hand, seeks to influence the reduction of life cycle impacts from products by creating such incentives explicitly. Rather than relying only upon price changes arising from policies applied at the point of waste generation to transmit the appropriate signals, EPR seeks to achieve this by integrating the appropriate incentives through responsibility. This is particularly important in cases where there is a very extended production-consumption chain, little vertical integration, and imperfect markets. With respect to EPR and PPP, there is nothing inconsistent about EPR insofar as the externalities are internalized within the product chain responsible for generating the externality.