Instruction
Design for **Environmentally Sound Use**

Basic Principles

The Task of Optimisation

The use phase of plastic packaging can also have relevant environmental impacts which should be reduced as part of Eco Design efforts. On the one hand, this relates to the release of plastics into the environment. The accumulation of plastic residues in the (marine) environment has attracted widespread public attention. These residues result in part from carelessly discarded plastic packaging (“littering”). This can involve the packaging as a whole or parts of it such as seals, lids or remnants of packaging that disintegrate once discarded in the environment.

On the other hand, relevant environmental impacts result from the interaction of packaging and products while they are in use. This includes unintended leaking of harmful packaged goods or the deterioration of packaged goods due to improper reclosure of the packaging after it is first opened.

Packaging that makes it easy to remove (only) the required amount of product (“portioning”) contributes to reducing the environmental impact, since this avoids wasting the packaged goods. Packaging that can be emptied completely and easily has the same effect. Here, too, wastage of the packaged goods and thus the environmental resources involved in their production is avoided. In addition, completely emptying the packaging also avoids possible subsequent disruptions in the sorting and recycling processes.

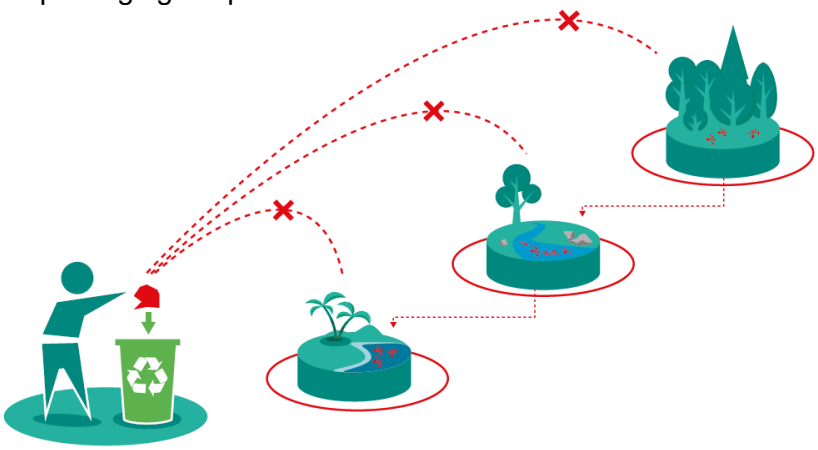
Given the environmental footprint of packaging and packed goods, the use of additional packaging material may be justified in order to achieve the goals of simple portioning and ease of complete emptying.

In addition, bearing in mind the imperfect disposal structures in some delivery regions, it cannot be ruled out that packaging waste may be disposed of there under primitive conditions, for example by using waste for heating or cooking, may be reused for entirely different purposes such as building material or may be ‘randomly’ dumped somewhere. Under unfavourable conditions, such haphazard and improper uses can cause health risks.

Optimisation Approaches

Approaches that contribute to “design for environmentally sustainable resource use” in an Eco design project and thus to reducing the negative effects of the use phase include:

- **Approaches 1 & 2: avoiding littering**
  through careful packaging design that reduces littering and thus potential problematic consequences of littering as far as possible, as well as easily comprehensible communication with consumers with clear advice on the need for appropriate disposal.
  - **Approach 1: avoiding littering at system level** starts with the choice of packaging used and aims at the most comprehensive use of orderly disposal procedures possible. This includes, if necessary, setting up an independent disposal system and the design of easily recyclable packaging or facilitating the possibility of reuse.
  - **Approach 2: avoiding littering at packaging level**
    At the packaging level, safety measures include clear instructions on correct disposal (e.g. “tidy man” symbol) and the avoidance or altering of small parts (for example, fasteners and safety seals), which can detach themselves when the packaging is opened.



- **Approach 3: safe resealing** by means of design solutions at packaging level, which make targeted use of the properties of particular plastic materials. This can lead to residual quantities of the product contained in the packaging being preserved and protected, so that potential spoiling of the product or leakage is largely avoided.
- **Approach 4: simple division into portions and ease of complete emptying** through which, particularly in the case of multi-person packaging, both excessively large servings and residual quantities can be avoided. This requires product properties, use conditions and consumer behaviour to be carefully taken into account.
- **Approach 5: reduction of substance-related risks deriving from misuse**
  Because of the great variety of forms of misuse, targeted total reduction of risk is unachievable. From a precautionary perspective, however, an effort can be made to ensure that packaging is as free as possible of substances which, under uncontrolled conditions, have an increased probability of harming health or causing damage to the environment.

Procedure

As provided for in the checklist for this strategy element, in an Eco design project it is appropriate to review and, if required, optimise a packaging design option according to the various optimisation approaches available.

Here, with the exception of the avoidance of littering at the system or packaging level, there is no clear hierarchy among the various optimisation approaches, and the check can in principle also be carried out in a different order.

Approach 1: Avoiding Littering at System Level

The most important basis for avoiding littering is the existence of a functioning waste collection system. This is the prerequisite for any subsequent orderly waste disposal system (including high quality recycling). Within the scope of these guidelines, a functioning return system is understood as one that covers at least 90 per cent of the household waste that arises (including packaging).

In areas with a basically non-existent or inadequate waste collection infrastructure, it takes a long time to set up a comprehensive state-run system. The development of distributor-owned and/or sectoral return systems may take significantly less time and, consequently, be part of a responsible marketing solution. It is important to have effective incentives that ensure a high rate of response.

If packaging can also be recycled into easily usable basic materials with simple technical solutions, this also provides a market incentive to collect and recycle the packaging.

The negative consequences of littering could also be alleviated if the packaging introduced into the environment were completely degraded without producing problematic substances. In fact, there is currently no practical way of checking whether “complete degrading without problematic residues” takes place under the very different conditions in various environmental media. In addition, biodegradable plastics are currently counteracting efforts to establish comprehensive functioning recycling structures in the particular delivery region. Since they cannot be recycled together with ‘traditional’ plastics, they would have to be collected and disposed of separately. Over and above the considerable additional expense, the necessary consumer information such as “Biodegradable plastic – Please dispose of separately!” might give people an incentive to not dispose of the packaging properly. Against the background of these unresolved challenges, the use of degradable plastics is currently not regarded by experts as contributing to the solution of the littering problem.

For some types of packaging, there are functioning multi-use markets in many supply regions which ensure that certain used packaging/containers are collected and reused. This applies, for example, to resealable, dimensionally stable plastic containers. Where it is possible to switch to such forms of packaging, this also helps to avoid littering.

With regard to approaches to avoiding littering at system level, the checklist includes the following questions:

Question	Instructions	Result
Is there a functioning waste collection system in the particular delivery region?	If **YES (**when at least 90 % of household waste is collected): go to approach 2 *“Avoiding littering at packaging level”*	[Please fill in]

Question	Instructions	Result
	If **NO**: document and continue to the next item to be checked.	
Can a (company's own) return system be set up which has prospects of achieving a significant return volume in the foreseeable future?	If **YES**: implement this approach and proceed to approach 2 *"Avoiding littering at packaging level"* If **NO**: state reasons and proceed to the next item to be checked.	[Please fill in]
Does it seem possible that through recyclable forms of packaging an effective impetus can be provided for the collection and recycling of packaging?	If **YES**: check further approaches associated with this strategy element (i.e. proceed to approach 2 *"Avoiding littering at packaging level)* and application of the strategy element "design for recycling" If **NO**: state reasons and proceed to the next item to be checked.	[Please fill in]
Is it possible for packaging to have a design so that it can be dealt with in the environment without any build-up of harmful substances?	If **YES**: implement this approach and proceed to approach 2 *"Avoiding littering at packaging level"* If **NO**: state reasons and continue to the next item to be checked.	[Please fill in]
Is it possible for packaging to be designed in such a way that related market interest in recycling is generated which would effectively stop littering through packaging?	If **YES**: implement this approach and proceed to approach 2 *"Avoiding littering at packaging level"* If **NO**: state reasons and critically evaluate marketing of packaging in the particular delivery region.	[Please fill in]
Result: Packaging solutions at system level which have been checked in connection with aspects of littering and, if necessary, modified as input for the further optimisation approaches.		

Approach 2: Avoiding Littering at Packaging Level

In addition to easy-to-read consumer instructions on the consumer packaging itself, it should be examined whether there are other options (e.g. at the point of sale) to inform consumers about the need for the orderly disposal of used packaging. Advertising activities should also look for ways of positively presenting the benefits of proper disposal. Consumer communication should be simple and focus on the central aspect: the disposal of used packaging in appropriate collection containers. This message is also conveyed by the 'tidy man' symbol.

If small parts have to be separated from the packaging in order to use the contents the packaging (such as seals, caps etc), there is a high risk that these small parts will be thrown away carelessly ('littering'). This applies in particular to packaging that is (also) used while travelling.

Design solutions that dispense with such small parts that have to be separated or that ensure these parts remain attached to the overall packaging are preferable in the design.

The review questions regarding litter avoidance at packaging level are presented in the following sections of the checklist:

Question	Instructions	Result
Are instructions for appropriate disposal clearly communicated?	If **YES**: document and proceed to the next item to be checked. If **NO**: improve communication and proceed to the next item to be checked.	[Please fill in]
Has the design been optimised in such a way that during use no (small) parts need to be detached from the packaging?	If **YES**: document and proceed with approach 3. If **NO**: improve the (anti-littering) design and proceed with approach 3.	[Please fill in]
Result: Packaging that has been checked at packaging level for avoidance of littering and, if		

Question	Instructions	Result
necessary, modified as input for the further optimisation steps.		

Approach 3: Safe Resealing

Since the environmental effects associated with the production of the contents are normally significantly higher than those associated with their packaging, protection of the contents is of great importance even after the packaging is initially opened. If a contribution to the protection of the contents can be made by reclosing, this justifies allocating additional resources to packaging as a rule.

If the contents are harmful to human beings and/or the environment, re-establishing a safe closed state must be provided for.

On the other hand, resealing is not an environmental issue for packaging whose contents are regularly consumed (i.e. under all normal conditions/types of use) immediately after they are used.

When choosing from a packaging point of view between different alternatives for safe resealing, care should be taken that, if possible, these solutions do not reduce the effects of other optimisation objectives (optimal use of packaging material resources, recyclability and anti-littering design) or do so as little as possible. Consequently, from the perspective of recyclability, it should be checked for example whether similar base polymers can be used for the various parts of the seal or at least recyclable or easily sortable base polymers.

The following review questions must be used in connection with safe resealability.

Question	Instructions	Result
Does the packaging contain a quantity of packaged goods which (in part) can only be used in several cycles?	If **NO**: document and conclude this strategy element. If **YES**: document and proceed to the next item to be checked.	[Please fill in]
Is safe resealing required after initial use in order to protect the packaged goods (e.g. against spoiling or contamination), or is this necessary for protecting the environment from them?	If **NO**: state reasons and proceed to approach 4. If **YES**: document the requirements of the resealing and proceed to the next item to be checked.	[Please fill in]
Has the packaging been optimised with regard to secure resealing?	If **NO**: modify the packaging in this regard and proceed to approach 4 If **YES**: document and proceed with the approach.	[Please fill in]
Result: Packaging tested for resealing and, if necessary, modified packaging solutions as input for review in further optimisation approaches.		

Approach 4: Easy Portioning and Complete Emptying

If the packaging contents are normally consumed (i.e. under all intended conditions/types of use) immediately after opening, the portioning issue is not relevant from the point of view of packaging design.

With many kinds of content (e.g. detergents, food), (also) from an environmental perspective, it is highly desirable that (only) the precise quantity of the contents required is removed/used. Here, aids to removing the right quantity as part of the packaging can be useful.

Simple portioning aids (such as measuring marks or dosing caps etc.) can in many cases fully implement the stated goal of removal of optimal quantities. The fact is that such simple aids are feasible without additional environmental costs.

Simple portioning aids may not be sufficient if the packaged goods tend to spoil after opening (e.g. due to contact with oxygen in the air); the need to use elaborate portioning aids must be checked here. More elaborate portioning aids of this kind range from separately packaged individual portions to very special aids (such as in the case of resin hardener systems for technical adhesives).

When choosing between possible costly portioning aids from the point of view of packaging technology, care should be taken that these do not negatively affect other optimisation objectives (such as recyclability and anti-littering design), or that such effects are as small as possible. If additional resources are used for these portioning aids, care must be taken to carefully check whether a reference to generally available portioning aids (measuring cups, kitchen scales etc.) is advantageous from an environmental perspective.

In addition, with regard to simple complete emptying of residuals, i.e. the possibility of completely removing the packaged goods, care should be taken from an environmental perspective that this can be done without additional aids or simply using commonly available household equipment. In implementing this requirement, packaging design is predominantly concerned with corresponding geometries (such as minimum opening widths, avoidance of inaccessible corners) or surface properties, which support outflow of the packaged goods for example.

The following review questions are to be considered with regard to portioning and complete emptying:

Question	Instructions	Result
Has it been established that the packaged goods can be completely removed from the packaging without any special equipment? (able to be completely emptied)	If **YES**: document and continue to the next item to be checked. If **NO**: adjust packaging geometry/characteristics, document the modifications and continue to the next item to be checked.	[Please fill in]
Does the packaging contain a quantity of packaged goods which (in part) can only be consumed after multiple use cycles?	If **YES**: document and continue to the next item to be checked. If **NO**: document and conclude this strategy element.	[Please fill in]
Is a portioning aid necessary in order to support the goal of optimal use of the packaged goods?	If **YES**: state reasons and continue to the next item to be checked. If **NO**: document and conclude this strategy element.	[Please fill in]
Is a simple portioning aid helpful and sufficient to guarantee optimal use of the packaged goods?	If **YES**: state reasons and if necessary design such a “simple” portioning aid and then conclude this strategy element. If **NO**: state reasons and continue to the next item to be checked.	[Please fill in]

Question	Instructions	Result
Can an elaborate portioning aid be designed?	If **YES**: state reasons, check, and if appropriate design such an "elaborate" portioning aid and then conclude this strategy element. If **NO**: state reasons and conclude this strategy element.	[Please fill in]
Result: A packaging solution related to portioning and complete removal of packaged goods that has been tested and, if necessary, modified.		

Approach 5: Reviewing Reduction of Substance Risks Due to Improper Disposal.

Substance-related risks can result from a wide variety of inappropriate uses and result in exposure:

- Incineration of packaging remnants for heating or cooking purposes under poor combustion and exhaust air conditions => exposure of people to health hazards through the air pathway
- Use of incineration ash as a fertiliser in horticulture => indirect oral exposure through the consumption of produce
- Use of packaging materials as building materials => possible exposure for example through long-term skin contact
- Use of old packaging for food storage => indirect oral exposure through food intake
- Illegal dumping in soil and/or water => possible long-term environmental exposure

Targeted and complete risk reduction is not feasible given the multitude of conceivable use and exposure situations.

From a precautionary perspective, however, the aim is to ensure that the packaging is free as far as possible of substances that, under the uncontrolled conditions outlined above, have an increased likelihood of causing harm to health or environmental damage. This applies for instance to substances:

- that are classified as of very high concern (SVHC substances)
- which are persistent bioaccumulating and toxic substances (PBT properties)

Due to stringent statutory requirements, substances with these properties are for the most part not used in food packaging.

A simple assessment is much more difficult in terms of avoiding other substances that could lead to health hazards if packaging wastes are handled improperly, for instance by being used as heating and cooking material.
Unquestionably, uncontrolled burning of halogen contents in packaging may give rise to toxic emissions, while (heavy) metal contents would certainly be problematic if the resulting ashes were used for garden fertilisation. But for a well-founded assessment of potential health hazards associated with such unforeseen use, a professional assessment of individual substances and mixtures is required on a regular basis, which goes beyond a simple general suspicion of certain substances or compounds.

If packaging is delivered to regions where such improper use of packaging waste is anticipated, a targeted assessment of the risks that may result from the substances used in

the packaging should be carried out where appropriate. The appropriate check question follows:

Question	Instructions	Result
Has an assessment been made of whether potential environmental and health risks associated with haphazard disposal or other misuse of packaging waste can be reduced by the choice of input materials? (To be used in delivery regions with inadequate disposal structures.)	If **YES**: packaging is "low in problematic substances". If **NO**: avoid shipping to regions with 'critical' disposal structures or carry out a targeted evaluation and, if necessary, change the materials used or modify formulas for packaging materials.	[Please fill in]

The result is one or possibly several packaging solution(s) which have (also) been tested to determine their problematic material content (with regard to inferior disposal solutions) and possibly modified.