Sustainable Packaging: How do we Define and Measure It?

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ABSTRACT

Sustainability in the packaging domain is receiving increasing attention, however, internationally there is no clear understanding about what constitutes 'sustainable packaging'.

This paper presents a draft definition of sustainable packaging. The definition aims to reconcile the valuable roles played by packaging in social and economic systems, while also acknowledging the need to meet ambitious environmental goals. It introduces the goal (sustainable development) as well as key ideas such as the need to consider the product/packaging system as a whole and to consider the entire product life cycle. It considers the three elements of sustainability: the economic or commercial functions that packaging fulfils, and its social and environmental functions. It also differentiates between different levels of concern, i.e. from the macro levels of society (prosperity and well-being), the intermediate levels of the product/packaging system (efficiency and effectiveness including product waste prevention) to the micro levels of packaging materials (closed cycles or zero waste) and packaging components (safe or non-toxic).

In conjunction with the definition, the Sustainable Packaging Alliance in close cooperation with Australian based (including global) companies, is developing a Packaging Impact Quick Evaluation Tool (PIQET©). PIQET© will be a decision support tool that provides packaging technologists and managers with hands-on input for defining company packaging strategies, selecting materials for packaging re-design or packaging innovation, and specifying packaging for procurement of incoming goods. This presentation outlines the early developments of PIQET©.

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INTRODUCTION

Packaging has long been targeted as a waste generating medium and is therefore a focal point for community concern and government response. Government response varies from strict regulations to voluntary agreements between stakeholders. Most of these measures are developed around the traditional waste management hierarchy (reduction, re-use, recycling, recovery). More recently the focus has begun to shift towards more holistic principles and alignment with the ideals of sustainable development with the inclusion of the entire product lifecycle in the evaluation and improvement of products and packaging systems (Shinn 2004). Many have questioned the appropriateness of regulatory frameworks that focus on recycling and reduction of packaging material consumption per unit of product, resulting in the emergence of policy tools such as the European Integrated Product Policy (IPP) (Sturges 2003) and the EU Thematic Strategies on 'Sustainable Use of Natural Resources' and 'Prevention and Recycling of Waste' (Day 2004).

At the same time, companies are starting to realise that long-term viability and ability to meet shareholder, community and other stakeholder demands needs addressing of sustainability issues (Sturges *et al*. 2003). Although for most companies this imperative is yet to be owned, let alone implemented, a recent survey of 141 top companies, all members of the World Business Council for Sustainable Development (WBCSD), found they performed better in almost every market segment than respective benchmark indices (Anon, 2005). On average the companies returned 13.5% in the year to 31 August 2004 compared with 9.2% for the markets generally. Also their three and five year performances were significantly better than the markets, suggesting that sustainability is helping companies to boost performance (Anon 2005).

Packaging has a key role to play in sustainable development. However, its high visibility married with its importance as an essential facilitator for the distribution, marketing and safe use of consumer and other products, creates significant challenges for advancing sustainable development in packaging. Consumer behaviour and spending trends, market segmentation and developments in distribution are examples of drivers for new packaging formats and technologies, which are often contrary to the principles of sustainable development (James *et al*. 2005).

In addition to such converse technologies, there are a number of other barriers to sustainable packaging such as the complexity of product marketing systems, maintaining commercial advantage, required capital investment associated with new technologies, and inability to identify and adopt step change technologies that support packaging sustainability (James *et al*. 2005). However, one of the most pressing and overarching challenges in advancing sustainable development in the packaging domain is the lack of a clear understanding of what constitutes sustainable packaging. Such a widely recognised and accepted understanding is crucial and prerequisite to the long-term sustainability of packaging and associated business development.

DEFINING SUSTAINABLE PACKAGING

The Sustainable Packaging Alliance (SPA, www.sustainablepack.org) was formed in Melbourne (Australia) between Victoria University[1], RMIT University[2] and Birubi Innovation Pty. Ltd. in 2002. If step changes and continuous improvement in packaging sustainability issues were to become a reality, the founding SPA partners recognised the need to develop an integrated, supply chain focused, multi-dimensional approach to research, education and training (James *et al.* 2005). One of the first initiatives of SPA was to establish a research project, led by Helen Lewis at RMIT University, to create and promote a vision of sustainable packaging.

As a first step towards defining sustainable packaging, a stakeholder survey was undertaken with the aim to explore the current connotation of sustainability for companies in the packaging supply chain and some of its key external stakeholders. The stakeholder survey results – which were presented at the IAPRI 2004 Conference in Stockholm (Lewis and Sonneveld 2004) - highlighted that defining terms such as 'sustainability' in relation to 'packaging' is difficult to comprehend by most stakeholders. Most respondents raised systemic issues such as meeting higher environmental standards in conjunction with the need to meet the requirements of the economic system for transport, distribution and protection of products throughout the supply chain. The role of the consumer was also identified as a critical one. Packaging sustainability will need to reconcile the often conflicting consumer expectations - with regard to increasing needs for convenience, safety and shelf life as being provided by packaging - with the higher aspirations that many of the same citizens have for a greater environmental sustainability of packaging (Lewis and Sonneveld 2004). The full survey results are available on SPA's web site (www.sustainablepack.org).

SPA's sustainable packaging definition

Utilising the results from the stakeholder survey the first draft definition of sustainable packaging was composed. The definition takes into consideration the role packaging plays in our social and economic systems and the need to strive to meet environmental goals (Figure 1). It aims to differentiate between macro levels of society associated to prosperity and well-being, the functional performance level (efficiency and effectiveness) of the product/packaging system, the environmental performance level of materials (impact and waste prevention) to the micro level of human and eco toxicological soundness of the packaging components (James *et al.* 2005).

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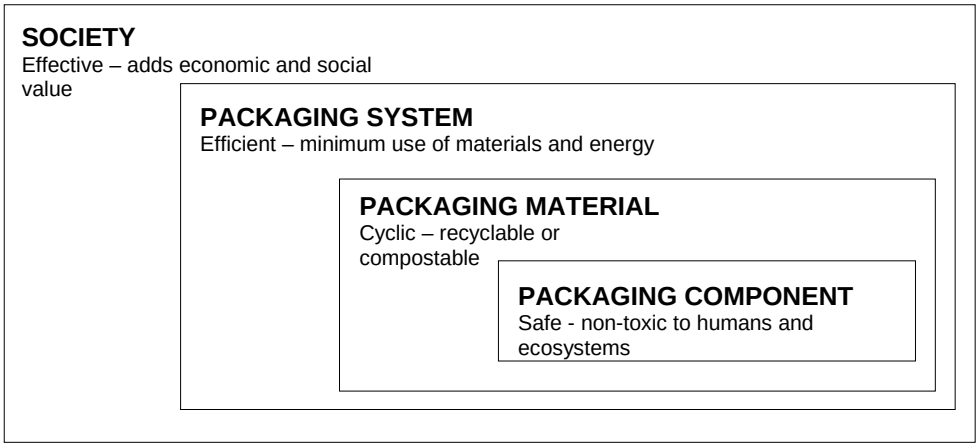
Figure 1 The four levels and principles of SPA's sustainable packaging definition



Source: (James et al, 2005)

Table 1 summarizes this first, preliminary definition, and is being disseminated to encourage further debate. The goal is sustainable development with consideration of the role of the product/packaging systems and the entire life cycle. The economic, social and environmental functions of packaging are considered in the context of sustainability and are differentiated between different levels of concerns (James *et al.* 2005).

Table 1 SPA's sustainable packaging definition

Packaging will support sustainable development if the following principles are met		
Principle		***Levels at which the principle is applied***
Effective	It adds real value to society by effectively containing and protecting products as they move through the supply chain and by supporting informed and responsible consumption.	Society
Efficient	Packaging systems are designed to use materials and energy as efficiently as possible throughout the product life cycle. This should include material and energy efficiency in interactions with associated support systems such as storage, transport and handling.	Packaging system
Cyclic	Packaging materials are cycled continuously through natural or (industrial) technical systems, minimizing material degradation and/or the use of upgrading additives.	Packaging material
Safe	Packaging components do not pose any risks to human health or ecosystems. When in doubt the precautionary principle applies.	Packaging component

Source: (James et al, 2005)

The next stage of the project will be to undertake further consultation through a series of focus groups with companies and consumers and the application of the definition to examples to make the concepts tangible. In addition SPA welcomes any feedback and discussions from international stakeholders, in particular research organisations and industry focus groups with a specific interest in advancing packaging sustainability. The aim will be to obtain global consensus among stakeholders and to translate the definition into more specific targets, performance indicators, guidelines and tools.

However, while the definition of sustainable packaging will continue to be debated companies are seeking immediate directions for the implementation of sustainable development principles in product packaging development.

EVALUATING PACKAGING SUSTAINABILITY

In parallel to the drive towards sustainable packaging development and a widely accepted definition for sustainable packaging, there is an immediate need for tangible indicators to facilitate continuous improvement in packaging environmental performance. Packaging supply chain stakeholders, and brand owners in particular, demonstrate a fast increasing interest to be able to credibly evaluate the environmental performance of product packaging systems (SPA 2005).

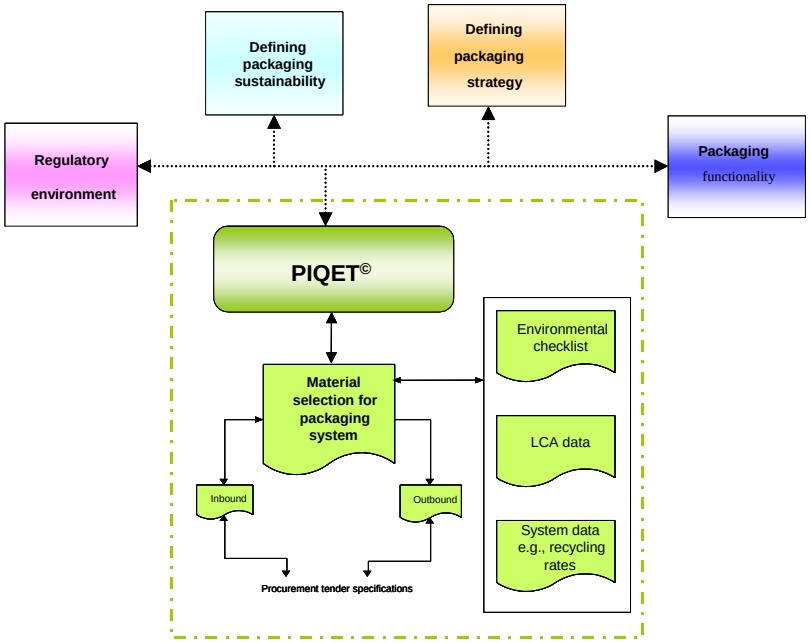
The development process of product packaging systems involves many professional disciplines such as, for example, designers, engineers, technologists, marketers, and environmental managers. It requires a multi-disciplinary, collaborative and holistic approach, but there is an ad-hoc expectation for packaging technologists in industry to provide comprehensive and credible information to others within and external to the organization. This information ranges from packaging material characteristics, to packaging functionality in distribution and use, to processability in manufacturing and filling, and to environmental impact (SPA 2005). A significant degree of understanding and skills is needed to appropriately collect and analyse such information and to be able to present the findings to internal company decision makers (SPA 2005). This is often even more emphasised by the need to meet targets imposed through voluntary or regulatory measures such as, in Australia, the anticipated strengthened National Packaging Covenant (NPC) framework featuring a comprehensive series of performance indicators (SPA 2005a).

Hence, company packaging technologists would benefit from the availability of a widely accepted tool that enables them to rapidly assess, generate and report credible environmental information based on a multi-criteria evaluation (SPA 2005a). With such a tool various packaging designs could be compared and it would provide the ability to evaluate variations in packaging components and to develop company standards (benchmarks). To be valuable in decision making, such a multi-criteria evaluation will need interaction with company packaging strategic directions and linking in with packaging functionality related to product performance, life cycle impact data, material consumption, distribution and transport scenarios, production capabilities and efficiencies, and post-use waste management options and scenarios (SPA 2005).

PIQET©

In recognition of the need for packaging technologists to have credible, business-ready tools for multi criteria packaging environmental decision making, SPA is undertaking research to develop a Packaging Impact Quick Evaluation Tool (PIQET©). PIQET© ideally will enable packaging professionals to quickly provide credible indications of (anticipated) environmental performance indicators to support decision making towards defining and implementing their organisation's and market environment's packaging performance and environmental requirements (see Figure 2). Example applications of the evaluation tool include materials selection, packaging re-design or packaging innovation, and procurement specifications for inbound packaged goods (SPA 2005).

Figure 2 PIQET© in concept



Source: (SPA 2005)

PIQET© must consider all levels of packaging, the functional performance of the system and social issues such as litter and consumer convenience. Through direct and up to date data links with industry practices and performances, PIQET© will enable identification of opportunities for environmental impact improvement and support company commitments towards the NPC including generating reports that link in with anticipated NPC performance indicators (SPA 2005a).

In the lead up to developing the project scope and definition, SPA has established a food brand-owner advisory group to provide input. The need, scope and functionality required of PIQET© has been developed through workshops of the advisory group and a broader SPA Roundtable. The first generation of PIQET© will support product-

packaging design and development decision making within the food packaging supply chain specifically (SPA 2005). Some of the functionality requirements and challenges for such a tool are outlined in Table 2.

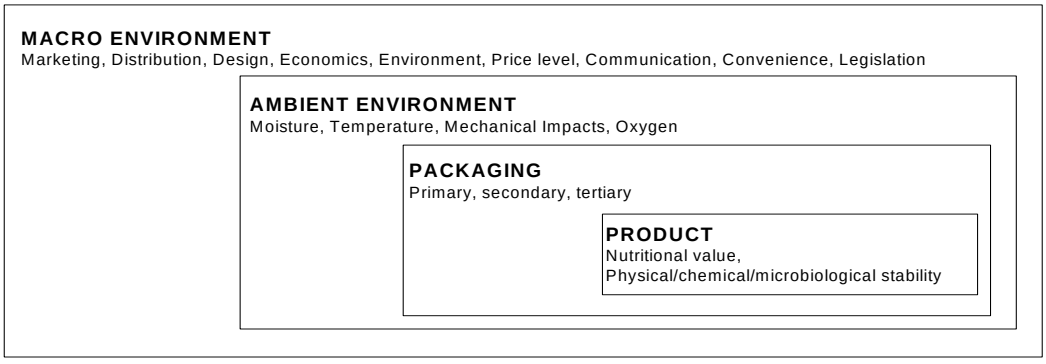
Table 2 Examples of the functional requirements of PIQET©

Criterion	Requirements
Quick turn around	Input data readily available (indicators); Default data for non-available specific data;
Easy to use	Limit information input by operator; Menu driven;
Quick scan vs detailed evaluation	Ability to cut short input specific data; Define minimum specific data required for tool to run (remaining data input based on default settings); Company specific defaults;
Environmental focus	Link with company environmental management strategy Link with Australian NPC KPI's and targets and reporting
Environmental comparator	Ability to compare on environmental details (e.g. material consumption, recycling rate,) Ability to link environmental variations to technical and commercial variations (trade-offs);
Modelling features	Waste management scenarios related to distribution context (e.g. specific recycling systems in place in anticipated distribution geography); Distribution/transport scenarios; Product packaging system scenarios; Standard scenarios with option for modelling specific scenario;
Information access	Links to common and regularly updated information sources such as: • NPC • Material Selector • Waste management practices

Source: (SPA 2005)

PIQET© will consider all levels of packaging and different product categories (see Figure 3) and will allow for assessments of packaging systems for both inbound raw materials and packaging for outbound products.

Figure 3 Proposed structural components for consideration in PIQET©



Source: In (James *et al*, 2005) and adapted from (Kooijman, 1996).

The tool will be developed on the basis of critical environmental impact characteristics (taking system boundary conditions into account) of packaging systems. These will be identified, and adapted for selected application areas (e.g.

beverages, dairy products, preserved foods), through an analysis of recent Australian and overseas packaging and packaging related Life Cycle Assessment (LCA) studies in relation to the Australian context (SPA 2005).

The PIQET© Challenge and Development Approach

The overall challenge to create PIQET© lies in the ability to develop and validate robust, efficient algorithms that link environmental characteristics of packaging materials and systems with the functional and commercial context of their application. The result is envisaged to be a quick yet accurate and appropriate evaluation of environmental impact. However, the potential variables and diversity of packaging systems and the physical and commercial environments in which they need to perform makes this a complex task (SPA 2005).

As a first step in taking up this challenge, SPA is focussing on the methodology development and proof of concept for applications within the food packaging environment. This is being undertaken in close collaboration with Australian based, including global, food companies.

This first prototype will have an environmental focus and will be limited to a selection of typical food and beverage packaging systems. Furthermore the variations in materials and packaging system characteristics will be limited. Selected packaging case scenarios will be used to develop and evaluate the robustness of the prototype in handling varying packaging system scenario contexts (SPA 2005).

Once the first prototype has been successfully demonstrated, PIQET© will be further developed by up-scaling to include the widest possible variety of materials, packaging system characteristics, and distribution and waste management scenarios. In the longer term SPA aims to expand PIQET© to integrate commercial and social indicators related to packaging. In parallel the tool will be further detailed to include applicability to other product areas (non-foods) and variations in geographical context (SPA 2005). With inclusion of the latter, the tool will become applicable for packaging that is used to distribute products to export markets.

SUMMARY AND CONCLUSIONS

Sustainability associated to product packaging systems is an abstract and complex concept, and one that is very much open to interpretation. To be able to advance sustainable development in packaging, stakeholders need specific guidance as to how they can implement it into their daily business practice. The traditional narrow focused paradigm of waste reduction and recycling is loosing its validity within the context of packaging sustainability and a more holistic approach is essential to meet future community and industry challenges.

The Sustainable Packaging Alliance has taken the initiative to establish a draft, definition of sustainable packaging and is seeking international debate and comments with the aim to advancing the definition towards a globally accepted guidance framework.

In conjunction with defining sustainability, SPA has recognised the need to translate the complexity of sustainable development, environmental regulations and complex environmental assessment protocols, such as LCA, into practical tools for the diversity of skills and functions involved in packaging sustainability decision making. In response SPA is undertaking research to establish a credible robust methodology to develop a Packaging Impact Quick Evaluation Tool (PIQET©) for use by packaging professionals in industry. This multi-criteria packaging evaluation and assessment tool aims to link environmental impact with functional and commercial performance, with a first step focussing on developing the methodology and proof of concept. Ultimately PIQET© will enable users to quickly and accurately evaluate environmental performance in conjunction with the technical, commercial, social and regulatory context of the packaging system to support packaging strategic decision making underpinning sustainable development.

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