



“A knowledge Alliance in Eco-Innovation Entrepreneurship to Boost SMEs Competitiveness” SMecoMP

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**PB3** Bulgarian Industrial Association – Union of the Bulgarian Business (BG)

**PB4** Trakia University (BG)

**PB5** "St. Kliment Ohridski University" Bitola, Faculty of Economics-Prilep RNM

**PB6** Agency for promotion of entrepreneurship of the Republic of Macedonia

**PB7** Cyprus University of Technology (CY)

**PB8** Cypriot Enterprise Link (CY)

**PB9** Youth Entrepreneurship – NE (GR)

**PB10** Chamber of Commerce and Industry of Ioa

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# **ECO-INNOVATIVE PACKAGING TO PROTECT THE ENVIRONMENT**

## **Introduction**

The waste generated by discarded packaging is a growing problem facing the environment around the world. Packaging waste is constantly growing and becoming one of the most harmful environmental impacts, primarily due to the lack of information among consumers and their unawareness that they are polluting the environment.

To minimize the negative environmental impacts, the solution should be sought in new, innovative packaging and the use of innovative solutions with new materials. A significant role in determination of the sustainability, i.e. the shelf life has the construction and design of the packaging. What maintains the quality of the product is the right choice of packaging materials and technology. Traditional materials such as wood, paper, cardboard, metal, glass, laminate and plastic should not be overlooked and what we've learned from them should be introduced into new materials that offer us great options for packaging and packaging design. The design of new packaging should stimulate consumer awareness to choose environmentally friendly solutions, recycle and ultimately take care of the environment and a better tomorrow.

Therefore, environmental protection should be an integral part of people's lifestyles, and waste should be something that everyone should take care of.

## **Concept and division of packaging**

The term packaging means everything in which the product is placed, as well as the material with which the product is wrapped. The packaging can be divided according to the following criteria:

- packaging material,
- basic function,
- durability and
- separation.

The most commonly used packaging materials in the world are: cardboard, metal, glass and plastic. The functions of the packaging are: to protect the product, to help with transportation,

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to increase sales by attracting customers, economically viable, usable and environmentally friendly.

### **Ecological function of the packaging**

Packaging of products with ecological bundle is an important element for consumers. In recent years, they have become increasingly aware of the need for environmental protection and therefore, if they have the opportunity to choose between packaging that pollutes the environment and one that is environmentally friendly, they will choose the product with eco-packaging. Times are changing and people are becoming aware that environmental concerns need to be addressed. This change has brought with it a wave of new businesses engaged in the production of eco-friendly packaging. Product packaging requires a good knowledge of production technology, design, materials and other processes to be synchronized.

As a result of environmental concerns in the last twenty years, the question of the ecological function of packaging has come to the fore. The impact on the environment can be improved in a number of ways: by packing products in packaging whose material is recycled, by selling a larger quantity of the product in aggregate packaging, by reducing the number of packages around a product, by using biodegradable materials and packages that can be eaten. When it comes to food protection and packaging, proper packaging can have a significant impact on the environment and help reduce waste.

### **New eco-packaging materials**

Natural packaging materials provide a wonderful alternative to plastics that is omnipresent on the market. Plastic has a number of functions, but is often difficult to recycle.

Unconventional materials such as hay, agricultural waste, mushrooms, coconut fiber, bamboo, etc., are materials that come "from the ground" and can be easily returned there after use. These innovative packaging made from natural materials can be recycled, composted, it is biodegradable, and can be reused for a variety of purposes.<sup>1</sup>

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<sup>1</sup> <https://www.packagingoftheworld.com/2015/02/how-to-make-your-packaging-as-eco.html>

### ***Mushroom-based packaging***

A truly innovative alternative to the plastic foams that protect products is offered by the American company Ecovative Design, which produces packaging using agricultural waste and the basic structure of mycelium mushrooms.<sup>2</sup> This mushroom packaging can be formed in almost any shape. It can also be used for surfboards, car bumpers and even clothes. If placed in the ground, it is completely biodegradable. This is a unique packaging already used by companies such as Dell, Steelcase and the US National Oceanic and Atmospheric Administration.



Picture 1. British luxury beauty brand Wildsmith Skin's Copper Peptide Duo is packaged in a mushroom-based compostable box<sup>3</sup>

### ***Bamboo***

The most common packaging options are paper and plastic. However, they are not unique.



Picture 2. Bamboo products<sup>4</sup>

Bamboo, which belongs to the family of wood and grass, can also be found in the composition of many products with a wide range from food to floors. Now bamboo has

<sup>2</sup> <http://ecovatedesign.com/mycelium-foundry>

<sup>3</sup> <https://www.newsbreak.com/news/ONpkRuuO/mushroom-based-skincare-packaging>

<sup>4</sup> <https://organicbeautysupply.eu/shop-eng/536-pandoo/1026-pandoo--4-pack-bamboo-toothbrush/>

become one of the great packaging solutions. The bamboo grows very fast, 1 cm per hour. It is the fastest growing plant in the world. This makes bamboo a very renewable source and alternative to plastic foams and various types of paper and cardboard. Like steel, bamboo can withstand heavy loads, so it is used for ships, scaffolding and other things that require strength and flexibility. Dell Technologies is the first in the industry to make bamboo packaging with a renewable source. The plants are grown in lowland areas (many miles from the nearest Panda). This amazing recovery rate makes them perfect for environmentally friendly Dell laptops. And when the products are opened by the customers, the bamboo tampons are easily recycled.<sup>5</sup>

### ***Palm leaf***

Packaging and product from palm leaf are completely natural, compostable and 100% biodegradable. The material is great for packaging due to its strength, it is elegant and heat resistant. Palm leaves offer a great choice because they vary in thickness, color and pattern.



Picture 3. Palm leaf packaging

### ***Banana leaf***

Banana leaves have been around for thousands of years and are an ideal material for packaging products.

They can be very useful for the environment if used more often. Banana leaves have a wide range of applications because they are large, flexible, waterproof and look beautiful. They can be used for wrapping food, making bags, boxes and utensils.<sup>6</sup>

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<sup>5</sup> <https://corporate.delltechnologies.com/en-us/social-impact/advancing-sustainability/sustainable-products-and-services/materials-use/bio-based-resources.htm>

<sup>6</sup> <https://www.biobasedpress.eu/2019/09/processed-banana-leaves-an-eco-friendly-packaging-solution/>



Picture 4. Banana leaf packaging

### ***Wax wraps***

Plastic bags do not sound bad in vain. When thrown in the trash, they fly easily and are everywhere - on branches, in water, on lawns. Fortunately, though shyly at the beginning, we get a replacement in the form of wax towels. If we have leftovers or want to preserve the freshness of chopped fruits or vegetables for the next meal, we generally put the food in a plastic container covered with foil or cellophane. However, waxes that are rarely sold can replace sticky foil. They are made of fabric, in which beeswax is embossed.



Picture 5. Wax wraps

This concludes that wax towels should not be used to wrap hot food so that the wax does not melt. Otherwise, wax wipes preserve the freshness of the food, so that the food can "breathe" and will not create mold. Wax towels are maintained by hand washing with cold or lukewarm water, with a drop of mild detergent. Such wax towels in North Macedonia are homemade and for the private needs only and are made by a female pensioner. Eco wax coating is environmentally friendly, practical, with a nice design and easy to maintain. Wax wrappers are also intended for storing fruits, vegetables, spices or bread. The coating "breathes" and allows the food to stay fresh longer, reducing excessive food waste. It can be used for six months or more. They are made of cotton material in different patterns and beeswax, which is procured by beekeepers.<sup>7</sup>

<sup>7</sup> <https://karpos.gov.mk/wp-content/uploads/2017/08/Karpos-In-Fevruari-mart-Br.-83-84-compressed.pdf>



## Design and packaging with environmentally friendly materials

Although packaging made of paper, plastic, metal, wood, or glass is still used today, people are becoming aware of the need for eco-packaging. Therefore, new packaging materials are constantly being developed that differ in structure and composition. Designers can also use some of the natural materials already mentioned above in the paper to enhance the packaging design.

Due to the short-term use of packaging, most of them regularly produce waste that must be recycled. Unfortunately, a large percentage of packaging still does not recycle, but ends up in mixed municipal waste. For this reason, new technologies, solutions, innovations and design are needed. The packaging will thus gain added value to consumers, an increased recycling rate and help reduce overall energy consumption. An entire new field of creativity and business has been made possible by the application of eco-innovation and eco-design. In addition to packaging, products must be designed for easier repair with less power consumption.

The application of nanotechnology in packaging can reduce the disposal of large amounts of food. With the help of nanotechnology, the packaging can be made better, stronger and allow the product to last longer.



Picture 6. Intelligent packaging with a time indicator<sup>8</sup>

Applying nanotechnology in packaging will reduce production costs and increase the availability of material.

The intelligent labels of the product, or the product itself, can show if the food is fresh and stored properly, e.g. by discoloration as a result of a chemical, enzymatic, or microbial reaction.

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<sup>8</sup> <https://www.nanopack.eu/2018/02/09/future-packaging-already/>

## Conclusion

While it may be a small step, reducing the use of bags in supermarkets is a significant attempt to reduce waste in the environment. Illegal rubbish dumps are everywhere. Oceans, seas, rivers, and even streams are full of rubbish, most of which are not of organic origin. By creating huge amounts of waste that is improperly stored, we upset the natural balance and poison the earth, water and air.

In recent years, the development of product packaging materials has improved significantly, mainly due to high demand for product safety and environmental impact. In addition to reducing pollution and energy savings, as well as lower product prices, the development of new eco-friendly packaging is changing consumer spending. Eco-conscious consumers are increasingly looking at which products are included in the eco-packaging that can be discarded after using the product without worrying about contaminating the environment.

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