

the world in 2025

An interview with Jim Carroll

Four trends
driving change
towards
2025 are...

- ▣ Impact of technology, especially digital
- ▣ The next workforce generation has a fundamentally different outlook
- ▣ Growth potential across many markets thanks to economic volatility
- ▣ Quicker prototyping, designing and testing to reduce time to market



THE WORLD IS CHANGING AT A RAPID PACE, BRINGING UNCERTAINTY AS WELL AS UNTAPPED OPPORTUNITIES ACROSS ALL SECTORS AND GEOGRAPHIES. IN THIS ARTICLE, IN SPEAKS TO RENOWNED GLOBAL FUTURIST JIM CARROLL ABOUT THE TRENDS SHAPING THE WORLD, AND SPECIFICALLY THE PACKAGING INDUSTRY OF TOMORROW. WHAT WILL THE WORLD LOOK LIKE IN 2025?

10 years is a long time with the potential for many changes – how do you see the current “norm” changing over time?

We are witnessing massive transformations across every single market, industry and profession. The rate of change is accelerating dramatically compared to past decades, a trend we expect to see continue.

The impact of technology and the acceleration of science are having a huge impact on this. In addition, our collaborative global community is enabling ever-faster discovery and implementation of new ideas. The power of the next generation shouldn't be underestimated – as a generation they are highly skilled at seeing and implementing new ways of doing things – in addition to the emergence of new industry competitors.

One of the biggest drivers impacting many industries will come from a shift in control, with Silicon Valley driving the pace of change and innovation more than ever. Industry now has no choice but to act and innovate at the same speed to stay ahead of the game.

Consequently, tomorrow's world is going to be an entirely different place. In fact, I think it's fair to say, it will be completely transformed. We're on the edge of absolutely massive change!

Below, Carroll outlines what he sees as top trends.

Africa will have ceased to be a rural continent

By 2025, the majority of the world's population will live in less than 30 mega-cities demonstrating a continued trend towards global urbanization, driven in part by greater economic security and an ever increasing global middle class.

There are great opportunities for the development of business involving “mega-city infrastructure support services”, for example – transport, water, and energy “micro-grids”. As you can imagine, the support system for a city of 20-40 million people is vastly different to that of a small city.

It's great to see so many innovators out there already looking for viable solutions, for example, how do we generate energy for such cities? We can see technology emerging to facilitate this switch, just two examples being glass buildings generating solar energy and vertical farming – if we can build skyscrapers for people why can't we do this for our food supply?

Much of the world will have “gone up”

Because of mass urbanization we are running out of space leaving two solutions: dig down or build up. Towering buildings incorporating innovations in construction will be one of the business growth stories in the years leading up to 2025.

Many pioneering thinkers are now looking at how we can best use the limited space we have left. For example, we are now able to build structures out of wood that are eight to 10 stories high because of our deeper understanding of science, methodologies and architecture. This is providing urban areas with lots of new potential. This innovative “skyscraper” technology is going to be a big trend leading into 2025, with new jobs emerging as a result (for example, vertical farming infrastructure managers).

A dichotomy of life-expectancy will be the new normal

Rapid advancements in medical science in the western hemisphere, the impact of lifestyle changes, and a new “super-health” diet will lead to the first human living to 140. Yet, at the same time, society could be grappling with a decline in life expectancy in Asia, Africa and the Middle East as sectors of the population develop the same lifestyle diseases as North America and Europe.

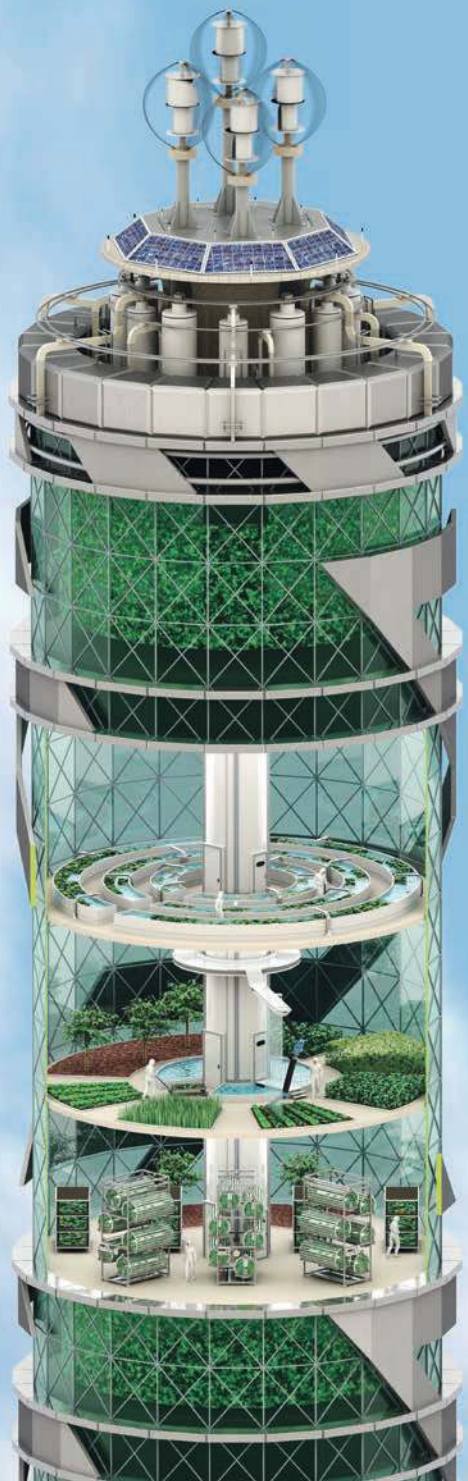
We are going to see big changes in the pharmaceutical industry, both in packaging and the product. Accessible and intelligent packaging – with packaging becoming part of the product – will see a big tech-up. In theory, a pill will have the power to transmit information from the body to the package and to the doctor. Tiny bio-sensors will be embedded in all kinds of packaging. Packaging will also help verify counterfeits and we will be increasingly able to track our wellness through mobile devices and bio-connected medical devices, including small chips under the skin that feed critical data back.

Sub-Saharan Africa will have emerged as the world's new China

This area holds a wealth of opportunities, for example, in infrastructure development. We have seen this happen previously in the BRIC countries (Brazil, Russia, India, China) as they transitioned into middle class. Consequently, it now costs substantially more to produce goods in these countries compared to 10-20 years ago and companies are starting to explore where the next big business opportunities exist. Naturally they are being drawn to these new regions which have huge unlocked potential – not forgetting, we will see almost a billion new consumers entering the global market in the next decade!

We are also seeing an increase of “in-sourcing” with companies taking production and bringing it back locally as it is no longer cost effective to manufacture overseas.

VERTICAL FARMING



Dickson Despommier, a professor at Columbia University, talks vertical farming...

Although horizontal farming will always remain a constant, we have to accept that farmers will be unable to grow today's crops 50 years from now due to climate change. These irreversible changes are already occurring and beginning to recalibrate the agricultural landscape. What we're seeing is a climate change issue that is severely affecting outdoor agriculture, coupled with heightened levels of urbanization and a booming human population.

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DID YOU KNOW

Vertical farming uses

70-80%

less water than
traditional farming!

GROWING UP...



Vertical farming – as the name suggests – refers to cultivating crops in multi-story greenhouses. These vertical farms are fitted with modern technology (hydroponics, aeroponics and aquaponics) and enable crops to be grown in the center of urban areas. Being a closed loop agricultural system it is the cleanest industry you can imagine, filtering dirty air and rain water during the process. ▶

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DID YOU KNOW

The world requires an area of agricultural land the size of South America to feed itself²



GROWING UP... VERTICAL FARMING

The concept of vertical farming has been around since the 1980s – when we started to realize a change was necessary – but didn't evolve into a viable solution until the late 1990s, thanks to technical advances.

However, today we can no longer avoid the need to find new solutions. One example are wine growing regions which can be used as a barometer to measure climate change as grapes require such a specific regime of humidity and temperature to grow. In fact, according to wineologists, in 50 years wine growers in Bordeaux will no longer be able to grow grapes in the region. We can see in many regions that optimal wine growing conditions are moving north in the northern hemisphere and south in the southern hemisphere – for example, ideal climatic conditions for growing the Pinot Noir grape are shifting steadily north from the Napa Valley, towards northern California and even into Oregon.

These changes are also having a tangible impact on corn, wheat, barley, rice and other cash crops. As our

THE LINGO...

Hydroponics

the process of growing plants in sand, gravel or liquid laced with nutrients but without soil

THE LINGO...

Aeroponics

a technique for growing plants in which the roots are suspended in the air, growing in a fine-nutrient-laden mist

populations expand we will need to start growing crops in new regions that don't necessarily have the correct soil types. Vertical farming provides the opportunity to bypass these regional environmental hurdles by creating prime exterior conditions indoors.

Encouragingly, an increasing number of big companies are now getting on board with vertical farming and developing the idea at a corporate level, including Toshiba, Panasonic and Goldman Sachs – who are funding a large vertical farm in Newark, New Jersey. A clear demonstration that vertical farming is a viable and efficient way of growing food for urban populations and industry will have a core role in making this happen.

Vertical farms are also beginning to harness the power of natural energy sources. For example, the power of geothermal energy is being harnessed in places like Italy, USA, Iceland, New Zealand and Japan. Huge opportunities also exist in places like Australia where the climate is favorable and solar energy could be used. There will be a whole

THE LINGO...

Aquaponics

a system of aquaculture, in which the waste produced by fish supplies the nutrients for plants to grow hydroponically (in water, without soil). In turn, the plants purify the water which is returned to the fish tanks to begin the cycle again

host of alternative energy solutions to generate electricity for these farms meaning the more we invest in thinking about how to do things ecologically, the more economical the process of vertical farming will become.

Vertical farming presents a huge investment opportunity, and as you would expect, the concept is now gaining extensive global interest thanks to the possibility of creating inexpensive, healthy and locally produced food. For example, we only need to look to China which has employed US company, Green Sense Farms, to develop 20 vertical farms across major cities in the country.

Benefits of vertical farming

- 1 Year-round crop production – there are no seasons in a vertical farm, so any crop that can be grown indoors can be produced year-round, locally
- 2 Requires very little water – water is scarce in many locations but water used in vertical farming is recycled in a closed loop cycle which means availability and waste of resources is not a problem
- 3 Employment opportunities – vertical farms are located in the city and therefore provide employment, in a pleasant environment for urban dwellers
- 4 No soil contamination – with no agricultural run-off, need for fertilizers or heavy metal contamination, vertical farming eliminates the usual pitfalls associated with outdoor traditional farming
- 5 Repurposes old buildings – warehouses equipped with the right infrastructure make the ideal vertical farm, negating the need to destroy old buildings

FARMS OF THE FUTURE

Solar powered irrigation systems



SunCulture is providing solar-powered irrigation systems for farmers in Kenya, enabling them to grow additional fresh fruits and vegetables at less cost. The system – delivering water directly to crop roots – provides yield gains of up to 300 percent and 80 percent water savings! In areas of low and unpredictable rainfall, this system is proving invaluable and ensuring farmers can avoid high fuel costs, negating the need for diesel powered generators.

Drones for crop management



Start-up PrecisionHawk has created a lightweight drone to gather high-resolution aerial data enabling the agriculture industry to “optimize area usage and increase land use efficiency”. The system – integrating drones and software – provides information on “the status and health of crops and soil”, enabling maximum crop yield. Going one step further the drone can also identify areas at risk of drought, detect disease (in plants and animals) and estimate growing time for crops. A highly useful tool for drought affected regions.

Dairy hubs



A dairy hub refers to community dairy “development programs” which have been launched successfully in Bangladesh and Pakistan and are currently being piloted in East Africa and India. Linking smallholder farmers to dairy processors, this model enables cost cutting, higher incomes, healthier livestock as well as access to proper infrastructure. With milk being an important source of energy, vitamins and minerals, it also increases the availability of a long-term supply of safe, affordable and local milk in these regions.

Active ◀ and intelligent ▶ packaging

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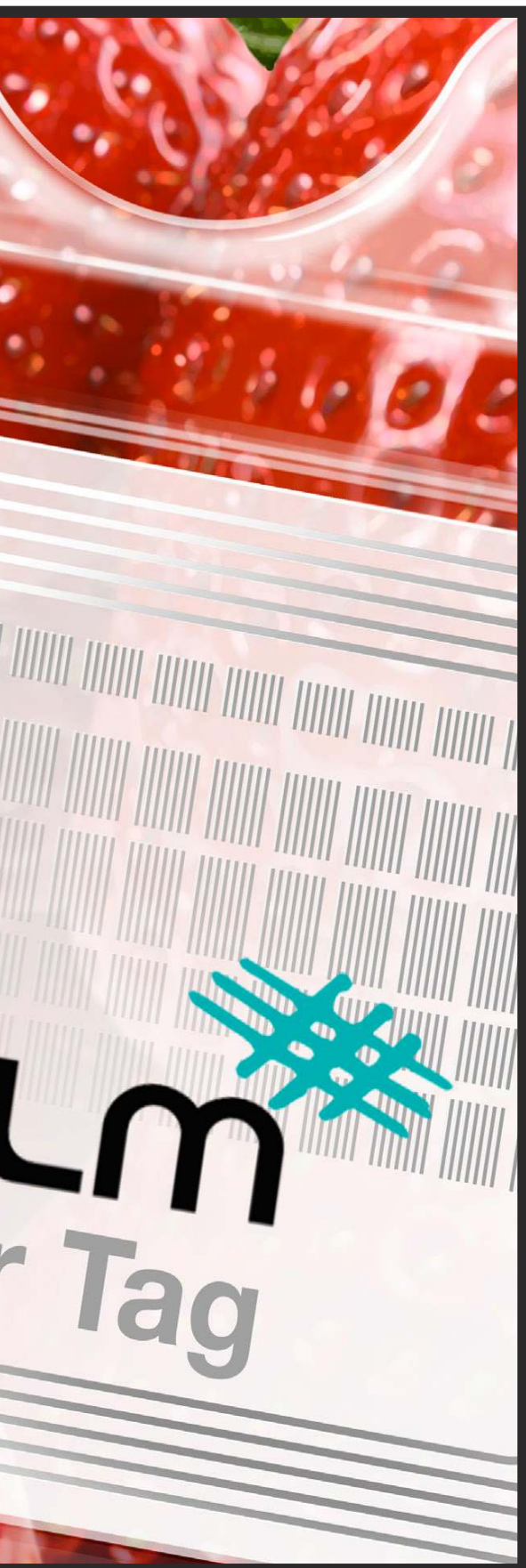
DID YOU KNOW

\$21.41 billion

Estimated market for active
and intelligent packaging
by 2019

THINFI
RF Sensor

When we think of packaging, words like "active" and "intelligent" aren't typically what comes to mind, but thanks to new sophisticated technology, packaging is increasingly becoming more intelligent, providing consumers a heightened level of information never available before.



Both active packaging and intelligent packaging involve functions that go beyond the containment and protection of a product. The difference between the two is that while active packaging acts directly with the packaged product – by interacting chemically or biologically with it – the aim of intelligent packaging is to detect and communicate information about the condition of the product, without taking a direct action.

Packaging that is active and intelligent promises to extend shelf life, monitor freshness, improve safety and convenience. This is a market segment with huge potential for the future and analysts project active and intelligent packaging to grow at a CAGR (compound annual growth rate) of 9.25 percent, reaching \$21.41 billion by 2019, from the actual estimate of \$13.75 billion.¹

▶ Active packaging

aims to monitor the condition of the packaged goods. Active food packaging interacts chemically or biologically with its contents to extend shelf-life and maintain food quality for as long as possible.

Common applications:

Oxygen scavengers: the best known and most widely used of active packaging. Designed to eliminate residual oxygen from the package's headspace or to attain zero-permeation. A chemical absorbent is integrated into the packaging material or added inside the package with a sachet or a label. Oxygen scavenger packaging is commonly used for oxygen-sensitive beverages, fresh products, snacks, and ready-to-eat products.

Antimicrobial agents: inhibit the growth of undesired micro-organisms on the food surface. The antimicrobial agents are either emitted directly onto the food or slowly diffuse themselves from the packaging material to the food.



Food and pharmaceuticals will lead the growth in this segment with the pharmaceutical industry expected to be the fastest growing, due to the changing health care needs of aging populations; the increased spread of chronic illnesses; and the increased use of temperature-sensitive drugs.²

▶ Intelligent packaging

aims to inform. It can sense an attribute of the product and communicate this information to users or trigger active packaging functions. Its main purpose is to indicate whether or not the quality of the product has deteriorated. In Europe and North America, strict regulations surrounding the use of active packaging have been encouraging the use of intelligent packaging.

Common applications:

Time-temperature indicators: are small measuring devices attached to the package surface that can indicate if a predetermined temperature threshold is exceeded. Such indicators have strong potential for pharmaceuticals, where high value, temperature-sensitive biotechnology drugs are increasingly adopted.

Freshness indicators: immediately display the quality of the packaged food. They detect volatile or non-volatile compounds or changes in the product itself and can be embedded via optical detectors, labels and tags.

Tracking services: look to monitor the quality of perishable goods during transportation, storage and sale. For example, intelligent packaging can alert the end-user if the product has not been kept at an optimal temperature during the transport and storage phases.

*For footnote information see Index on pages 80-84