

**PÖYRY POINT OF VIEW:  
BEING RESOURCE SMART**

A blurred, high-speed photograph of a supermarket aisle, viewed from the perspective of someone pushing a shopping cart. The shelves are filled with various products, and the motion blur creates a sense of rapid movement through the aisle.

# Global Diet: A menu with radical business consequences

# How can business digest the consequences?

There is nothing more everyday and down-to-earth than choosing what to eat. With increased living standards, the range of choice expands. At the same time, we are here dealing with a powerful engine of disruption. The hand that picks the milk carton at the store is the very “visible hand” that disturbs global patterns of resource use and trade flows. Land use, energy consumption, mining and the consumption of packaging and hygiene products are but a few examples.

In this age of disruption, the global diet will be a surprisingly powerful catalyst for business change. All industries need to be prepared for the consequences, so in this Point of View we look at key questions such as:

- is the global diet going to change land use for forest industry, mining, and agriculture?
- what will happen to biomass sourcing for bioenergy, the forest industry, chemicals and other bioproduct sectors?
- what will happen to land prices? Is availability the key question or will we simply see rising prices everywhere. Is land the next hot commodity – or has much already been taken?
- will food packaging due to this change become a hotbed of innovation and global transformation?
- Will the special sector of antibacterials and hygiene grow to a tremendous value chain across sectors?

Food is a global commodity. A drive towards locally produced food exists in both the Western world and elsewhere. Is it a question of environmental concerns or security of supply? We are very far from being a world of self-sustaining local communities: food production and consumption simply do not match. Likewise, improved living standards change a local food balance towards an import dependency. Urbanisation is a powerful



driver. The Megalopolises of East and West are helpless giant babies, needing to be fed by their surroundings from ever further away. The next step from megacities which we are now witnessing is the emergence of “ $\Omega$ megacities”; i.e. the end of the line (from alpha to omega), which grow to the size that keeping them alive demands never before seen amounts of global resource streams. These “ $\Omega$ MEGACITIES” run the risk of becoming ends of the line - too large for the carrying capacity of their surrounding environment. The contrast between urban centre and rural area is ancient. Rome was an “ $\Omega$ MEGACITY” of its time, importing almost all its food (grain mostly from Egypt, olive oil from Spain, fish from as far as Judaea) and



“The hand that picks the milk carton at the store is the very visible hand that disturbs global patterns of resource use and trade flows.”



commodities. But Rome was an exceptional, singular place - now we have a surplus of mega- and  $\Omega$ megacities, hunting ever wider for sustenance.

We also introduce key new concepts such as the **'Food Trend Radar'**, the **'Global Shopping Cart'** and **'Peak Land'**.

The timing of these potential changes will be crucial – and also the order in which they happen. As in all upheavals, there will be winners and losers. It is very unlikely that 'waiting this one out' is a successful strategy. This is not a hyped-up alleged miracle sector; this is a basic human need changed by basic human desires for improved living.

#### **FOOD TREND RADAR: FEAR, LOATHING, AND DESIRE UP TO MEGA- AND $\Omega$ MEGACITIES**

A mix of drivers is guiding current developments. Our 'food trend radar' indicates a few important blips on the screen. Fear and wellbeing compete - it is almost like a "fight or flight" response curve. "This is delicious, but has it been contaminated?". So many food scandals have taken place across the globe, and consumers who can afford to be, are hesitant to buy food where the origin is unknown.

Will an E. coli epidemic like the German EHEC spread through what I am eating? Has the security of the food delivery chain been rigorous: the right temperature and hygiene?

What is hidden can suddenly become a major issue – in Europe the practice of substituting cheap horsemeat for beef had been going on for years, but after a single revelation, the issue evolved into a full-blown, Europe-wide scandal. At the same time, new needs arise with new and existing prosperity - from new tropical fruit to fast foods. The "Little Emperor" is a Chinese phenomenon. With a one-child policy, and that child most often being a boy, grandparents and parents focus on one single small individual. What that individual eats is the focus of two generations of supervising adults and risk aversity is rampant, characterized by the Chinese "milk scandals".

# Peak everything

Agreed, a large deal of the world's population does not have the luxury of shopping carts in a climate-controlled supermarket. However, where food is (over)consumed and where consumption is increasing, the shopping cart is a good metaphor. Let's take four significant carts: the Western world, China, Russia and Brazil. General trends combine with local culture and conditions.

1. **Western world's cart** - we already fill our baskets with the best of meat, exotic fruit and vegetables and other global top-quality food items, but we are worried that the contents will poison us, spread illness, or have climate change consequences.
2. **Chinese cart** - a new world of more meat, fruit, fruit juices and dairy is filling the cart. At the same time, a distrust of local brand safety pulls consumers who can afford it towards imported dairy products, from Scandinavia, for example, which are perceived as safe.
3. **Russian cart** - the tendency now seems to be to pack the cart with more meat and dairy products, combined with a craving for fast foods.
4. **Brazilian cart** - a recent poll<sup>[1]</sup> indicated that the average Brazilian would spend extra income in the first place on food. In Brazil, people already eat more meat than bread, and even more meat is on the horizon – bigger carts and bigger freezers?

## AN ENDLESS MARKET - OR A 'POPULATION PYRAMID SCAM?'

What has become an "accepted truth" in consumer analysis of an emerging middle class in China and India indicates that there will be half a billion new spenders in both countries at some point between 2025 and 2040. This middle class will want almost everything we have in the West – the last brand to enter the markets loses. This "truth" is actually "population pyramid scam" thinking. India has a very broad population pyramid. Assuming that the broader levels of the pyramid will receive the living standards of the current West means that some other

level of the pyramid will provide the resources needed. This is all fine – that is, until the moment resources start to run out and somebody has to pay.

## GNAWING HUNGER FOR FOOD AND LAND

Food needs both land and sea areas. Focusing on land areas, Pöyry made an approximate calculation based on consumption forecasts for the need of additional land for meat and dairy, cereals and oils, biofuels and other uses (see Figure 1). The need for land for cattle grazing dominates in most regions. One area stands out: the China/Southeast Asia region has a land need of 430 million extra hectares. These extra hectares must to an overwhelming degree be found outside the existing area – but where? Thus, a single consumer decision at a supermarket in China, repeated time over, translates into a global revolution in land need and use.

## THE PEAK CLUB GETS NEW MEMBERS AS A CONSEQUENCE

To begin with, we had peak oil, which was introduced as a model predicting when the maximum for petroleum extraction would be reached with consequent decline. Oil price and new technologies and new deposits have kept moving peak oil forward in time. However, as a concept, it has been joined by many other peaks, including Peak Water, Peak Land, Peak Food, Peak Phosphorus – in short, Peak Everything<sup>[2]</sup>.

Let's define peak land as 'the moment when the amount of unused, unconflicted land area available for human endeavour reaches its maximum levels'. One should note the



term "unconflicted"; just because fertile and suitable land is there, doesn't mean you can use it – for social, military, legal, environmental or other reasons.

## PROTEIN PRODUCTION

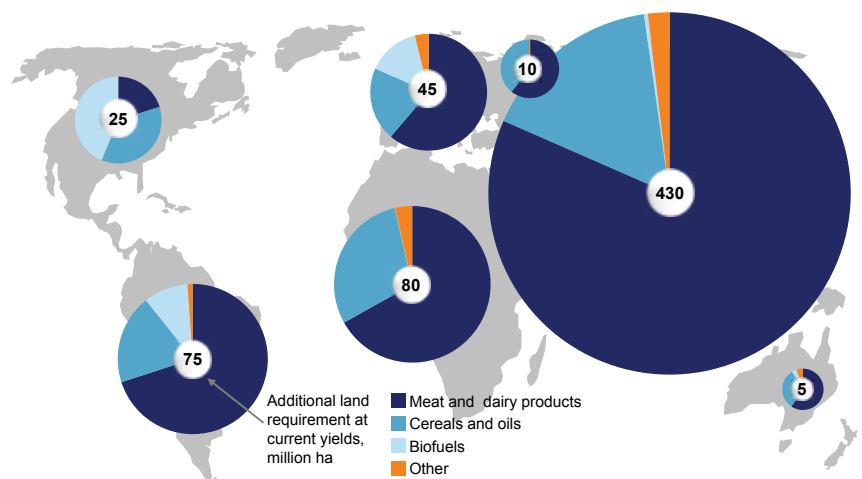
Proteins come from many sources: plants, dairy, meat, fish, seaweed and, in future, the laboratory. Many factors have an impact on the production of proteins; land is again in a key capacity, but factors such as overfishing, plastics in the world's oceans and other health-endangering factors for marine life, new types of protein farming and the attitude to genetically modified organisms will be decisive for the development. What the Pöyry calculation shows is a coming problem in protein production, possibly a lot sooner than 2050.

“Based on food consumption forecasts, we predict that land use in Asia will increase by 430 million hectares - but where will this usable land be found?”



FIGURE 1: HUNGER FOR LAND

The strongest land requirement growth takes place in Asia. Modest development expected in Russia and North America. Land requirement for cattle grazing dominates in all the regions except North America, where biofuels play a significant role.



# Peak Land, Peak Phosphorus, Peak Protein, Peak Toil

## FOUR CONNECTIONS: PEAK LAND, PEAK PHOSPHORUS, PEAK PROTEIN, PEAK TOIL

Estimates of the amount of available land in 2020-2030 have dropped as low as 200-300 million hectares, discounting hard-to-reach, unsuitable, hard-to-reclaim, conflicted, reserved land. At the same time, Double-P i.e. peak phosphorus remains troubling for food production. A recent study<sup>[3]</sup> indicates that growth in meat and calorie consumption has led to a 38% increase in the world's per capita 'phosphorus footprint' between 1961 and 2007. A growth of approximately 28 % was estimated to be just due to global diet changes. Thus, another verifiable fact over a 50-year period reinforces the power of global diets to change global resource flows. In China, aging population and urbanisation means a 'peak toil' will be linked to 'peak soil' – where do you find the eager labour to support the upper levels of the pyramid?

However, there has been less published on the "value hierarchy" of food. A protein-rich diet is a luxury, despite the absolute need for proteins for human development. Protein consumption grows with increasing living standards (see Figure 2). Using FAO forecasts for 2030 and selected other statistics, we built a scenario where protein production reaches its limit in 2050. "Labgrown protein" is not here counted into a major role - cellular food production may solve everything, or fail in unforeseen ways." Our calculation was based on published projections, the protein content in different sources, and land considerations. This is, of course, a scenario. However, so are all the other "peak" calculations. The specific, absolute numbers on protein from fish, meat, eggs, milk, plants in this Pöyry scenario are not the key item. The central point is the peak.



## FOOD FLOW FACING CHANGES

Global tradeflows are a lot less predictable than trade winds. The latter enabled the expansion of trade by sea, and are thus the origin of most global flows of goods. This circulatory system of arteries and veins (export and import) is vulnerable to sudden political decisions, economic crises, environmental crises, weather patterns and climate change. In Figure 3, page 7, current flows of grain are shown. The global diet is one factor that has the power to radically change many major tradeflows, in a domino effect scenario. Let us simplistically assume four types of changes: land-related, consumer-related, industry-related and political. The amount of change scenarios are enormous; and the dynamics actually resemble the global networked economy and what has happened lately. However, the pace is slower; in global diet, computers don't autonomously make billion-dollar decisions in a fraction of a second as in the stock markets. A storm from a global diet direction might come about when:

- politically, export of a certain key commodity is restricted (the Indian ban on cotton export in 2012, for example)
- landwise, land degradation combines with drought to both acutely and as a trend diminish yield in key food-growing regions
- consumers in China take a significant liking for imported meat, dairy, fruit juices
- significant industrial investments adapted to serve the Chinese market come online at the same time in e.g. packaging, metals and mining and food processing, leading to hypercompetition

The perfect storm, where a rare combination of the above aggravates the situation drastically, is as possible as on the financial markets.



“The Megalopolises of East and West are helpless giant babies, needing to be fed by their surroundings, and from ever further away.”



FIGURE 2: PEAK PROTEIN

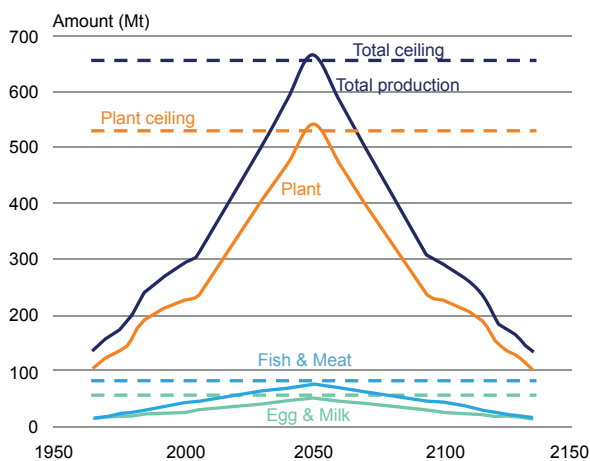
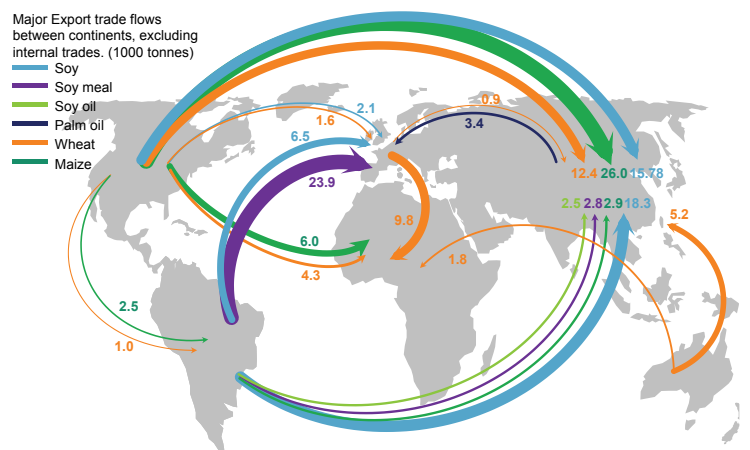


FIGURE 3: FOOD FLOWS FACING CHANGE: GRAIN



# Waste not, want not

## WASTE: THE TWIN-EDGED OPPORTUNITY

A loss rate of 50% in an industrial process would be considered sloppy indeed. However, the “Waste Not Want Not - Global Food Waste: Feeding the 9 billion” report from the UK Institution of Mechanical Engineers estimates that between 1.2 billion and 2 billion metric tons of food out of a total of 4 billion annually is never ingested. The food chain leaks at every link. The savings in human lives and health problems, costs, land use, energy use, water use would be very significant, with domino effects in all sectors and activities. Another estimate puts the annual monetary direct losses in the US from food waste at \$165 billion. So, putting every available resource at work on improving the food chain would be the greenest revolution possible, without any need for genetically modified plants or heavy-duty soil chemistry.

On the other hand, food waste is a valuable raw material, for example, biofuels. What is sometimes called ‘Zero Food Waste Zones’ are being attempted, with efficient use of food waste either as as feedstock or fuels, for example. This is admirable and efficient, but what is the total efficiency: should we have an inefficient food chain, where we collect the crumbs for processing, or a more efficient food chain with less byproducts? The answer depends on the circumstances and situation, but it is neither immediately obvious nor generic.



## GLOBAL DIET: BEFORE AND AFTER

Adverts promoting dietary products in the West often use ‘before and after’ images, showing the leaner, slimmer, happier individual as a result. In a globalised world, the order of the pictures has to be changed for cultures that read from right to left, e.g. China. For the global diet change, if even part of what is assumed here is realised, the changes will be profound for many sectors. Just taking some quite direct impacts:

1. in energy, e.g. the fuel use for logistics and the energy use for fertiliser will change with shifting trade and land use patterns. Likewise, the battle for land for bioenergy changes.
2. in packaging, the amount of transport packaging (for the haul) and consumer packaging (for sales of fruit juices, for example) will increase, and special demands will be introduced
3. in hygiene, the need for safety in the food chain will mean an increased use of hygiene products, both industrial and consumer-oriented
4. land use changes will have profound impacts on both sectors competing for the same land: food, energy, chemicals, paper and on nations, with social consequences of what is done where.
5. mining changes: as long as there is no replacement for phosphorus or way to synthesise it phosphorus mining will be a power base as diets change





The very “visible hand” that grips the litre of milk in the shop shakes the headquarters of companies, governments of nations and Earth’s ecosystem.



The very “visible hand” that grips the carton of milk in the shop shakes the headquarters of companies, governments of nations and the Earth’s ecosystem.

To ensure that the changes are as beneficial as possible, we need to do three things:-

1. better understand the link between consumer behaviour patterns and resource implications
2. develop a stronger grasp of global land use politics
3. develop new products, services and methods in logistics, fertiliser production, alternative energy and fuel solutions,

packaging, hygiene products, recycling, forestry, agriculture and agroforestry.



# Food for thought...

The right responses in specific situations vary, and adaptability is required, which is not easy for industry sectors used to bulk production line optimisation. Two responses among many can be lifted out:

- **a change in the dynamics of the key supply chains**, where companies at the consumer interface are forced to, at the very least, participate in the resource component: the markets will not accept a refusal of responsibility. Likewise, companies in the middle, e.g. packaging, have to finally move closer to their clients. The need for adaptation will be so great, that it has to be prepared well in advance. This restructuring will be painful, but necessary
- **resource-efficiency in every respect**, be it energy, water, carbon, metals or land, has to be done as an integrated concept. All too often an expedient response trumps the most effective response, for example less water use leads to more energy use. Resources are interconnected – also to the bottom line.

Instead of a BMI (Body Mass Index) for a diet, we will have a *Business Movement Index* indicating the shifts. The companies that understand this ongoing change and develop the right responses will be the winners in the global marketplace. Hopefully, the solutions are sustainable so that the Earth isn't the loser.



[1] Credit Suisse, *Emerging Consumer Survey*, February 2013

[2] *Peak Everything: Waking Up to the Century of Declines*, Richard Heinberg. (New Society Publishers, 2007, ISBN 978-0-86571-598-1)

[3] Headed by Geneviève Metson from McGill University in Canada

## Join the debate

[www.linkedin.com/  
company/Poyry](http://www.linkedin.com/company/Poyry)



@PoyryPlc  
#PoyryPOV



[www.youtube.com/  
PoyryPlc](http://www.youtube.com/PoyryPlc)



[www.facebook.com/  
PoyryPlc](http://www.facebook.com/PoyryPlc)



# About the Pöyry Point of View

Staying on top of your game means keeping up with the latest thinking, trends and developments. We know that this can sometimes be tough as the pace of change continues...



At Pöyry, we encourage our global network of experts to actively contribute to the debate - generating fresh insight and challenging the status quo. The Pöyry Point of View is our practical, accessible and issues-based approach to sharing our latest thinking. We invite you to take a look – please let us know your thoughts.

Copyright © 2013 Pöyry Management Consulting Oy

All rights are reserved to Pöyry Management Consulting Oy

No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form without the prior written permission of Pöyry Management Consulting Oy (“Pöyry”).

Disclaimer

While Pöyry considers that the information and opinions given in this publication are sound, all parties must rely upon their own skill and judgement when making use of it. This publication is partly based on information that is not within Pöyry’s control. Therefore, Pöyry does not make any representation or warranty, expressed or implied, as to the accuracy or completeness of the information contained in this publication. Pöyry expressly disclaims any and all liability arising out of or relating to the use of this publication.

This publication contains projections which are based on assumptions subjected to uncertainties and contingencies. Because of the subjective judgements and inherent uncertainties of projections, and because events frequently do not occur as expected, there can be no assurance that the projections contained herein will be realised and actual results may be different from projected results. Hence the projections supplied are not to be regarded as firm predictions of the future, but rather as illustrations of what might happen.

**Pöyry Management Consulting****AUSTRALIA**

Melbourne  
Phone: +61 3 9863 3700

**AUSTRIA**

Vienna  
Phone: +43 1 6411 800

**BRAZIL**

Curitiba  
Phone: +55 41 3252 7665

São Paulo

Phone: +55 11 5187 5555

**CHINA**

Shanghai  
Phone: +86 21 6115 9660

**FINLAND**

Helsinki  
Phone: +358 10 3311

**FRANCE**

Paris  
Phone: +33 156 88 2710

**GERMANY**

Düsseldorf  
Phone: +49 211 175 2380

Munich

Phone: +49 8161 48066

**INDONESIA**

Jakarta  
Phone: +62 21 527 5552

**ITALY**

Milano  
Phone: +39 02 3659 6900

**NEW ZEALAND**

Auckland  
Phone: +64 9 918 1100

**NORWAY**

Oslo  
Phone: +47 4540 5000

**RUSSIA**

Moscow  
Phone: +7 495 937 5257

**SINGAPORE**

Phone: +65 6733 3331

**SPAIN**

Madrid  
Phone: +34 615 457 290

**SWEDEN**

Stockholm  
Phone: +46 8 528 01200

**SWITZERLAND**

Zurich  
Phone: +41 44 288 9090

**THAILAND**

Bangkok  
Phone: +66 2 657 1000

**UNITED ARAB EMIRATES**

Dubai  
Phone: +971 4 6069 500

**UNITED KINGDOM**

London  
Phone: +44 207 932 8200

Oxford

Phone: +44 1865 722 660

**USA**

Atlanta  
Phone: +1 404 351 5707

New York

Phone: +1 646 651 1547

All photos, copyright Colourbox except Map image, copyright of Google Corporation

[www.poyry.com](http://www.poyry.com)

Pöyry is an international consulting and engineering company. We serve clients globally across the energy and industrial sectors and locally in our core markets. We deliver strategic advisory and engineering services, underpinned by strong project implementation capability and expertise. Our focus sectors are power generation, transmission & distribution, forest industry, chemicals & biorefining, mining & metals, transportation, water and real estate sectors. Pöyry has an extensive local office network employing about 6,500 experts.