

From the Bottom Up

A New Design

The Creation of the Fresh Fruit Generation

A Blue Economy Initiative that combines academic studies and science, with the commitment of citizens, waking up the entrepreneur in all of us, in order to transform society, while moving from scarcity to abundance, evolving from the production of waste to the restoration of Nature.

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EXECUTIVE SUMMARY

This year the world celebrates 60 years of disposable diapers. It started as a successful investment by the Swedish Government: to promote quality of life for all, as well as gender equality by reducing the burden especially on working mothers. The other major investment undertaken by the farsighted Swedish Government of the time was food packaging that has now become known as Tetra Pak. Both inventions led to creating a few billionaires. Society, however, has as a result become mired in an endless waste stream, one of excessive proportions. The well-intended desire to innovate led to consequences that were unforeseen, unintended and now completely out of proportion.

This year we celebrate **The Year of the Diaper** with the design of a new business model for the diaper industry. It is not about substituting one kind of diaper with another. That has been tried and has failed many times. It is about changing the way we design business, respond to basic needs and ensure quality of life, while building community, generating jobs, turning cities liveable, creating an abundance of fresh

fruit, and returning richness to the soil. And, by the way, also massively reducing carbon emissions!

It all starts with mothers' milk

When a mother breastfeeds, the baby's urine and faeces are of an extraordinary quality and quantity. A great variety of micro-organisms and substances are released after digestion and these contain energy, or life force. This is, after all, the core for building an immune system that is to protect a person's health for his or her entire lifetime. It also allows for new life to emerge. Therefore one should never denigrate this rich source of materials (used diapers and their content) as a waste problem. We are committed to reorienting the flow of this high quality mix of materials and to transform it. And transform it in such a way that it provides families with an abundance of fresh fruit – for generations to come

The From the Bottom Up Project

The *From the Bottom Up* Project empowers us to redesign a city, by creating a remarkable fruit belt surrounding an urban environment, providing – within a single generation – millions of tons of a wide variety of highly nutritious, seasonal fruit, and thereby adding to the biodiversity of the region. The supply of fruit, berries and nuts will be rolled out with planting and harvesting in tune with the cycles of Nature. This will attract more bees, more birds and offer more joy. At the same time, this project will allow for the creation of a spirit of community seldom seen in modern history – where everyone in the area will get to know each other, and will know the names of every baby who is contributing in their area.

This may seem like a vast undertaking. However, the start is very simple. The process requires a business model that has all the elements needed to redesign a city over time – starting with the creation of a community. This is a fresh look at the reality of both the problems and the needs of citizens. The ecosystem allows for the design of an initiative that is so effective and efficient that diapers can be offered for free. We envision one local assembly plant per 1,000 babies. The planting of trees on land provided by citizens and by the city will generate jobs while money is created by the sale of trees. How is this possible?

Cooperatives at the Core

We envision a small cooperative, consisting of 100 families at the core of this radical, positive transformation. Mapping software has indicated

that in vibrant cities, in every circle 800 m in diameter, there will be approximately 100 babies. This measuring process can be repeated hundreds – and in a megalopolis – even thousands of times. We will create a larger network, consisting of many smaller networks, based on babies and their families. Parents and grandparents who participate in the "Free Diaper Initiative" agree to picking up their free supply of diapers and dropping off used diapers at a central point every Saturday. Parents are also encouraged to bring organic kitchen waste in biodegradable plastic bags as both these materials are needed to convert these natural resources into black earth, also known as *terra preita*: the secret of highly productive farming by the Incas and the Vikings.

Parents are encouraged to change diapers as often as is needed, and not to wait an extra hour to save on diapers. Yes, we do encourage parents to get up for diaper changes frequently at night – according to their baby's feeding and weaning cycle to ensure their baby has a clean and dry bottom – without reliance on any super-absorbents that only weather, and hardly degrade. In this way the risk of an infant getting a urinary infection, that is painful and may even lead to infertility, is minimized.

Commit to Planting 1,000 Trees

There is no cost for the new diapers families receive when they return the soiled ones. All that is required is that every family commits to selling and planting 1,000 fruit trees every year. Everyone will receive the necessary training to enable them to do so. The total mass generated and the amount of black earth produced in a year amounts to an astounding one tonne per baby. This will provide enough carbon-rich soil to plant one thousand fruit trees.

During the trial phase in Berlin, families offered to pay for the diapers – even when not required to do so. We encourage people who want to pay to donate the money to the *100 Babies Cooperative* (or as we like to call it: *The Fresh Fruit Generation*.) These funds are not to be used for the project, but is rather allowed to accumulate to serve as a guarantee for investments in the future. On the basis of our pilot study a cooperative of 100 families can accumulate approximately €1.2 million within 25 years...and this only through voluntary contributions for the diapers.

From Scarcity to Abundance

All City official we approached are keen to contribute to the process. There are for two reasons for this. In the first place, decreasing the

number of diapers that end up in landfills (as diapers currently form 5-6% of landfills), and secondly, the conversion of soiled diapers to black earth saves money. As currently nearly all diapers are imported from overseas, the simple collection system of locally produced diapers cuts down on transport costs, reducing the excessive load of lorries shipping diapers in and out of the urban zone. Available land is used to grow large numbers of trees that will offer fruit for many decades, even for generations to come. If 1,000 families pursue these goals over 25 years, 25 million trees will be planted. If each tree offers on average 50 kg of fruit, the yield will be one million tonnes of fruit every year. We are clearly shifting from scarcity to abundance! We embrace a new era for The Commons, where what is good and necessary is provided for free.

Partnership with the City

Now if this is the impact a 1,000 babies and their families can have ... imagine the impact 100,000 families can have if they undertake to produce fresh local fruit in a capital city with a million or more inhabitants. It now becomes obvious that cities need to incorporate this remarkable opportunity to include a fruit belt in their master plans. Fruit growing on this scale is not new. The Prussian Emperors had orchards of thousands of fruit trees planted around their *Sans Souci* castle including apples, pears, and plums. They even had greenhouses for growing oranges, melons and bananas. We are returning to that wisdom, one of securing healthy soil that will ensure abundant food sources for decades to come.

Local Assembly and Local Jobs

For every 1,000 babies forming part of the project or for every 10 local cooperatives, there is sufficient demand to warrant local production of diapers. We do not have any guaranteed numbers, but say parents change their baby's diapers 8 times per day, then the local factory will need to produce 10,000 diapers per day. That is just under 3 million diapers per year. The local assembly, distribution and collection of diapers cut out the need for transport, where the last mile is always the most expensive and the one causing the most congestion. We have also learned a remarkable fact: parents who are prepared to walk the last 400 meters to get diapers for free. In the developing world, the distance covered for this purpose is often many miles.

Another advantage is that local production allows for adaptation to individual needs as far as absorption capacity, size, colour and even special content (such as odour controls) are concerned. Whereas before disposable diapers were symbolic of highly standardized mass production dependent on millions of hectares of forests, the total

expense of manufacturing these new diapers is now covered by the sale of fruit trees. And yes, the fruit trees do offer a major money generating opportunity, offering a wide portfolio of new opportunities, from the harvesting of fresh fruit for the local market, the preservation of these for the winter, and the providing healthy fruit for mother and baby, all from what is locally available.

The Network Economy

The responsibility for selling and planting fruit trees goes beyond only the parents. Mothers and fathers will mobilize their networks of friends and family, organising tree planting days. They will make use of corporate sponsors, ones that are keen to contribute to a worthwhile cause. Service clubs such as Rotary for instance will mobilize the funds. We are transforming the City – we are creating abundance.

Most cities have budgets for planting trees and available flows of cash can be diverted to the creation of this kind of community. In countries where cities are responsible for kindergartens and maternity hospitals, diapers are now offered for free, provided they buy the trees. New cities or towns can be designed to include a fruit belt. In a city with 100,000 babies, as many as 4,000 jobs will be created as part of the process, turning it into one of the greatest employment engines in the city. All starting with a mother's milk and the useful contents of her baby's soiled diapers.

For the time being the materials used for our newly designed diapers are being kept a secret. The first units were presented at the Free University in Berlin on 25th October 2015, on the occasion of the Entrepreneur Summit of Germany. The project is scheduled to start in Berlin on February 1, 2016. In the meantime, we are preparing ourselves for the orderly growth of the project, alongside citizens who are keen on making a difference, who will enjoy the transformation at hand and will demonstrate that the creation of a new economy is not only viable, but also enjoyable as it fills our lives with a deep sense of satisfaction – not only in Berlin but around the world.

Who are We?

We, the **think tank** of the ZERI Network, that was created in 1994 in Japan at the United Nations University with the support of the Japanese Government in preparation of the Kyoto Protocol, and the **do tank**, known as the Foundation for the Blue Economy that emerged after the publication of the Report to the Club of Rome in 2009 (under the same title), are harvesting the insights and the experience of 15 years of academic and field research and have learned that community can be created – and that sharing is indeed possible.

We clearly envision the radical transformation that can be attained **from the bottom up**, and the creation of an economy that embraces The Commons, where the technologies maybe patented, but the business model is shared open source. We envision the transformation where jobs are created in the City, and waste is turned into one of the most precious source of life: soil – from where life regenerates more life, food and indeed abundance. And while we are aware that this may be disruptive for existing businesses that may well react in traditional ways to this threat to do much better with what we have, we are convinced that there is no stopping the wisdom of the people, and that there is no stopping the unleashing of entrepreneurship, because yes: we do need to wake up the innovator in each one of us, and take decisions that are to benefit all.

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FACT SHEET ON THE CREATION OF THE FRUIT GENERATION

1. DESCRIPTION

- 1.1. Transformation of a waste stream (baby diapers) into a soil enrichment, and long term supply of fresh fruit.
- 1.2. Conversion of methane emissions into carbon fixation, relieving landfills of solid waste, and incinerators of toxic plastic blends, saving rivers and seas of weathered down acrylic super-absorbents.
- 1.3. Generation of a sense of community around health, food and environment in cities. People getting to know the names of each other's babies!
- 1.4. Creation of jobs and small-scale industries through entrepreneurial activities.
- 1.5. Implementation of inter-disciplinary research (from sustainable manufacturing to health, social, and soil sciences) into community supported initiatives.
- 1.6. Redesign the City, creating a fruit belt, ensuring a source of healthy food for generations to come. Also cutting down of truck transport.
- 1.7. Evolve from scarcity and global trade, to abundance and local supplies, re-introducing biodiversity and the supply of fresh fruit, berries and nuts.
- 1.8. Create a platform for personal exchanges, information and guidance on food, clothing, health, toys, sleep ... and the sky is the limit. A new platform for wisdom, production and consumption is created.
- 1.9. The re-introduction of clean and pragmatic industry into the city, ensuring that the cash stays in the city.
- 1.10 Building up local (financial) resources, ensuring resilience for the community.

2. PRODUCT of SERVICE

- 2.1. Community based collection service of soiled diapers that were manufactured regionally from natural materials that do not compete with food, and is converted (through mixing with kitchen waste, fungi and charcoal) into nutrient-rich black earth. This allows a low-cost fruit tree planting campaign that will in the long-term transform into a large, steady supply of seasonal, local fruit thereby converting nutritious and fresh fruit into a Commons

(available to all, for free).

2.2. The design and production of the diapers with the best available resources; the distribution and collection of diapers; the fermentation process combining micro-organisms and fungi, as well as kitchen waste into black earth; community participation and integration; the planting of indigenous fruit trees and; the long term platform for the harvesting of fresh, nutritious fruit for decades to come, on communal land such as parks, made available by-cities.

2.3. The creation of a sense of community, where families get to know each other and learnt the names of all the babies in the region; where the weekly gathering to return used diapers and the collect fresh ones will build a platform for dialogue where information can be exchanged regarding diapers, health, food, clothing, toys, sleep and so much more; where a support network can form amongst young families and life-long friendships can be forged.

3. TECHNOLOGY

3.1. The core of the innovation is a fundamental new approach to infant hygiene, where the novelty expresses itself in the revenue models, and the benefits obtained. A single product business (diapers) with non-renewable materials, traded globally at high transportation costs, and disposed off in a wasteful manner disregarding the quality of the content, is converted to a cluster of multiple benefits including several revenue streams, immediate and short-term cash flows, as well as immediate and long-term environmental and social benefits.

3.2. The successful implementation requires multiple innovations, which have been made possible by a remarkable team of scientists and entrepreneurs and a network of scholars who are dedicated to making this happen, mobilising the goodwill of citizens from around the world. This is the Blue Economy, also known as ZERI in Action, as described in the book with the same title in 2009, and its sequel The Blue Economy 2.0.

A. PRODUCT TECHNOLOGIES

1. Innovation in the design of the diaper: by designing a diaper with multiple natural layers, eliminating super-absorbents that are quasi non-degradable and poses a great risk to aquatic life since these absorb 500 times their own weigh, and 50 times their own volume.

2. Innovation in the design by including readily available materials, and the most productive fibres found on earth (mainly bamboo), while using bioplastics that do not compete with food production.

B. PROCESS TECHNOLOGIES

3. Innovation in the production of the diaper: working on machinery units that are profitable when producing 3 million diapers per year (supplying 1,000 families with 8 diapers per day)

4. Innovation in the hygienic treatment of the diapers: the conversion of organic matter through bacterial and fungal degradation, with kitchen waste and charcoal, into *terra preita*, a humus that is a compost enriched with carbon over a period of 6 months. The carbon content reaches up to 35%.

5. Innovation in the value chain of *terra preita*: converting its use into a high quality soil for a wide variety of indigenous fruit trees, reintroducing biodiversity providing a rich playing ground for bees.

C. LOGISTICS TECHNOLOGIES

6. Innovation in the distribution and collection of the diapers: supplying, from a central point, about 100 families with a maximum 60 diapers per week, exchanging used diaper buckets for fresh diaper buckets (lined with fungi) on receipt to speed up degradation. At the same time welcoming donations of kitchen waste, in one of the most efficient separate collection programs.

D. SOCIAL INNOVATIONS

7. Innovation in tree planting: working with parks (private and public), on unused land, and with local governments (cities and regions). To engage with cities and undertake planning for a 25 to 50 year long period of planting billions of fruit trees in and around the urban edge.

8. Design of the Commons, free and unlimited private use of fruit from trees on designated land as a way of promotion of locally grown nutritious food. Everyone has the right to take all they can carry.

E. BUSINESS INNOVATION

9. The conversion from a "sale of product" to a "delivery of a portfolio of services" model with a broad revenue model, including the recreation of the Commons and the sequestering of carbon and the building up of topsoil.

4. REVENUE MODEL

4.1. The following revenues reduce the risk, and increase the quality of

service, while it makes it possible to provide the core benefits of the diaper for free.

4.2. This is a combination of the free distribution of diapers with or without a service fee, that is agreed in advance or voluntary, that is a fraction of the cost of purchase of the equivalent number of diapers.

Subscribers do not buy a diaper, they become part of a new societal model that responds to infants' basic need for hygiene while responding to the community's need to produce local and healthy food especially for lactating mothers and babies at low cost.

4.3. The revenue models are decided by the "Free Fruit Generation Cooperatives" and while we refuse any "franchise" logic, with rigid rules and regulations, as well as any common branding, we wish to offer a portfolio of options that are consistent with our philosophy.

A. Service Fee

The "Free Fruit Generation Cooperative" could agree on a monthly service fee for the delivery of fresh and receipt of used diapers.

B. Sales of Humus

A monthly delivery of black humus soil for gardening purposes, both to private homes and nursery companies. There will be so much humus with such high carbon content available. People will want it and will be happy to pay for it.

C. Carbon Sequestration

This project is a form of massive carbon sequestration and there may well be candidates who want to offset their excesses through the Voluntary Carbon Exchange (as we have done for Las Gaviotas in Colombia).

D. Sales of Fruit Trees

We believe that the €5 charge per tree (the cheapest price currently on the market is €6.5/tree) offers the main revenue stream. This represents €5,000 per family, or for a collective of 100 families an astounding €500,000. For many families this will be too expensive, but families are not alone...

This turns into a remarkable cash flow based on the family network. Sale of fruit trees to families form part of the subscription program but as few families will have enough garden space to plant everything themselves ... more customers are needed and ready to buy as described below!

E. Contracting of Tree Planting for CSR

As employees and partners of organizations, one can organize the sales of fruit tree planting programs to companies (as corporate social responsibility initiatives). Large companies easily spend on this, and it is a matter of coordination, but this could represent up to 50% and also involves the extended social networks. It turns having a baby and creating a family into a

portfolio of initiatives that will ensure a *prosperous* future!

F. Contracting of Tree Planting for Greening of the Cities

As its citizens are paying taxes, enabling saving on truck transport, contributing to the reduction of the landfill load and contributing to cutting emissions, the City Government could also purchase fruit trees and organise planting programmes, as part of the greening of cities programs.

G. Consultancy

Consultancy fees and capacity building for communities or municipalities to deploy the process of diaper collection, conversion to black earth, planning of the planting of trees and harvesting of fruits, and its conversion into food and drinks in their cities. For a large city one can easily see the creation of 1,000 cooperatives of "The Fruit Generation" and this could generate additional revenues.

E. Workshops

The creation of a sense of community will give rise to the desire to embark on the design of communicating about other concerns: health, fashion, food, nutrition, toys and games, sleep, and so much more. Parents will want to host and participate in workshops for interested parties keen on developing the business models open source.

H. More Sales ...

Once the community has the confidence, and the network is established, room for more local sales of local products can be created, that will generate more revenues.

5. CLIMATE IMPACT

There is a multiple impact on climate. Whereas the details differ, the orders of magnitude of improvement are quickly understood.

5.1. Global versus Local

A globally produced and traded product is replaced by a locally assembled product with ingredients that are the best of its kind, and are part of the regenerative business model that is designed for its simplicity, while having the capacity to adapt to local conditions and needs.

5.2. Cut in Transportation

Transport to landfills and incinerators cut: through local collection and transformation of the organic material that moves to a local black earth facility aims to cut overall "diaper mobility" from source to tree and fruit to home by at least factor 5.

5.3. From Emissions to Carbon Sink

Transform extended methane emissions from landfill or carbon emissions

from incineration into carbon sink, especially the regeneration of carbon rich soil that will feed micro-organisms and trees.

5.4. Carbon, Phosphate and Nitrogen Rich

Sequestering carbon in carbon rich black earth rich in naturally produced concentrations of phosphates and nitrogen otherwise manufactured at high carbon costs, closing the loops.

5.5. Fruit Plantation

Sequestering carbon in large-scale fruit tree plantations.

5.6. Local Baby Fruit (food)

Reducing carbon emissions by making nutritious fruit grown locally available locally for consumption.

6. Who, what and when

6.1. The original idea of converting human waste to rich soil is nothing new: The Incas and Vikings pioneered the transformation of night soil and organic matter into black earth over one thousand years ago.

6.2. Anders Nyquist, the Swedish architect, was a pioneer in changing the habit of wasting water and excrement into producing nutrients. He was the first one to enlighten us on this.

6.3. Haiko Pieplow, from the German Ministry of Environment has for a decade now advocated the use of *terra preita*, (the Brazilian name for black earth). He has taught many the technique and has been generous in sharing the application as open source logic.

6.4. Ayumi Matsuzaka is a Japanese artist based in Berlin, who joined a team of creative and entrepreneurial women under the leadership of Ute Scheub (who also lives in Berlin). Ute is from the network 1000 Women for Peace, who with Nuria Costa, community leader from Mexico, alerted us to ways in which the processing of human waste can be turned into art. Ayumi Matsuzaka, with her dedication, was an inspiration to us and remains a core soul of this project.

6.5. Hao Dang, bamboo entrepreneur from Vietnam, who encourages the thousands of workers who work at his factory to use the ablution facilities there and leave their biological waste behind so that he can apply the nutrients to the bamboo plantations and produce methane in the process, offered great inspiration.

6.6. Joseph Jenkins wrote the eye-opening book *Humanure Handbook* that has been highly recommended by the Permaculture Network and which many of us have, of course, read. This book inspired us to go over to action.

6.7. Peter Thomas who for a few years ran tests on black earth production at

the Botanical Gardens of Berlin, mobilizing the interest of scientists and citizens alike. He showed that it was practical.

6.8. Prof. Dr. Ing. Günther Seliger, chair of Sustainable Manufacturing at the Science University of Berlin (TU-Berlin) who has accompanied the thinking process throughout the years and who is, with his students from around the world, committed to make the local machines work.

6.9. The test and trail team of Kreuzberg in Berlin that tested the ideas and led to the decision that this is worth building on.

6.10. Charles van der Haegen, Belgian former investment banker, who brought structure and management to the initiative.

6.11. Gunter Faltin, founder of the Entrepreneur Summit who believed that this is the entrepreneurial breakthrough of the year.

6.12. Louk Malmberg, from the Netherlands, legal counsel who secured swift and solid support to get the legal issues under early control.

6.13. The more than 40 peer group review members from the Cities of Bogota, Paris, Johannesburg, Milan, Surabaya (Indonesia), Palma de Mallorca and Antwerp who vetted the ideas and secured that we have a realistic idea of how to cooperate with governments and corporations.

6.14. Prof. Dr. Stefan Pickl and his colleagues of the University of the Bundeswehr who translated this experience into a fully transparent system dynamic computer model that visualizes the impact and ensures the continuous co-creation of this "changing of the rules of the game", the one that has only just begun!

6.16. And the Berlin team that is most supportive to Ayumi:

Jürgen Reckin, *terra preita* expert from Finowfurt, Ayumi's first scientist who experimented with the *terra preita* method in diapers inlay, aside from Ayumi's original experiments. He exchanged what? and advised us on the humification process.

Kathrin Rößler and the team from TerraBoGa, at the Botanic Garden Berlin, who supported the materials' trial and who experimented, along with Ayumi, with different inlays.

Rainer Buchholz from Terra Preita earth company, Wandrlitzer Erden in Klosterfelde, who supported the soil material and humification process for the trial.

Angela Clinkscales, Marta Depta, Susanna Viehmann from hybrid diapers company PURAPUR shared insights and experiences of material cycle,

shared the information of diapers industry and component of diapers inlay. The team supported the trials with their handmade compostable diapers inlay (prototype) in Berlin in 2015.

Michael Weiss, microbiologist of Steinbeis-Innovationszentrum Organismische Mykologie und Mikrobiologie, in Tübingen analyzed micro-organisms in fermented diapers inlays and proposed to find specific fungal agents that can break down the cellulose.

Marko Heckel, effective micro-organism company, Triaterra in Groß Pankow, gave practical advice to Ayumi's sanitation art projects since 2012 and supported almost all implementation materials to create Terra Preita substrate.

Eliana Lopez Gharardi, systemic designer in Berlin, graduated under Luigi Bistagnino at the Politecnico di Torino, developed the systemic flow of the nutrients and material cycle of the idea and compared with linear production of disposable diapers.

Alexander Prinsen, from the Netherlands, gave the structure of diapers trail in Berlin, added financial, strategy development and recruitment to the Berlin initiative.

Christian Schloh, web developer and architect supported logistic and planning part of Ayumi's experiments and trials.

Other supporters: Veronica Calri (graphic designer), Maaïke Reynaert (document), and Valentina Karga (Concept).