

## **Our Vision**

### **Our Vision: The Next 10 Years, 2005-2014**

#### **Starting with an Idea**

Thanks to the thousands of people who took the time over the past decade to meet, discuss, disagree and dialogue the concept of zero emissions; thanks to the ecosystems on five continents which shared their desire for life and their capacity to thrive even in the harshest conditions with little or nothing; we have now reached the moment to distill the next ten years from all these experiences. This reflection is not to be the privilege of the one who started this, but rather has to be the responsibility of all those who share the desire to pursue this venture.

It all started over a decade ago with a string of ideas: (1) we wish to respond to all the basic needs of all living species on Earth with what we have; (2) we wish to find creative solutions to the pressing problems of our time; (3) the way forward was first and foremost to convert waste into nutrients and energy for another. "Nature does not know the concept of waste; the only species capable of making something no one desires is the human species". This became guiding and starting principle of the ZERI program. The research and the initiatives that emanated from that vision were to be built on this design principle of nature.

There was time to observe nature, just look and see how well it works even if you are in the Namib Desert or in the Amazon jungle. There was time to admit failures in assessment, just rethink, accept mistakes and do better. Soon that guiding light on zero waste and zero emissions evolved in the 5 Design Principles of Nature. Action and reflection over the next ten years will thus benefit from a better understanding of how natural systems work, and this is only the very beginning of something none of us can conclude. We start having a better understanding based on the premise that this learning system is an never-ending process. So within another decade we may well have more principles and better insights to work with.

We now benefit from a more solid starting point, i.e. the Five Design Principles (anno 2005):

Whatever is waste for one is a nutrient or food for another species belonging to another kingdom;  
What is a toxin for one organism, is a nutrient or neutral for another belonging to another kingdom;  
Whenever highly complex ecosystems operate, viruses to remain inactive and even disappear without causing harm passing through at least 2 other kingdoms;  
The more local, the more diverse a system, the more productive, the more resilient; and,  
Whenever species of 5 different kingdoms live and interact in an autopoietic system, they can integrate and separate all matter at ambient temperature and pressure.

Thanks to thousands of people who spared time and energy, it has been possible to learn and see, return to the original question "can we create a society or an industry without any waste" and rephrase the intentions, ultimately reshaping that same vision. ZERI would not exist today if it were not for some 100 individuals (36 are featured in the profiles of the network of scientists) who really have offered more time, effort and inspiration than anyone else. They somehow became the mentors of this initiative. Perhaps some have not even any clue they did so. The thinking and vision today is the symbiosis of all these visions and experiences. This permitted us to move from a fantasy, to a process of trial and error, ultimately arriving at the creation of a new reality. Now time has come to envision how ZERI can go beyond whatever has been achieved today over the next decade (2005-2014).

## 1. Three Research Agendas

The next decade the ZERI network will not look so actively for another bright 100 mentors, but would rather wish to broaden the existing dialogues and build up a deeper and broader understanding of how the biosphere, the interaction among the species belonging to the five kingdoms of nature. The living species on the Earth's crust can indeed inspire us to design that social tissue, that production and consumption system that is capable of responding to everyone's needs. There emerge several major challenges. We should pursue a series of thought provoking concepts, while at the same time search for a more effective means of implementation.

### 1.1. How does Nature Makes Order Out of Chaos?

The complete logic of society is based on deterministic laws of physics and narrowly defined scopes of action. Business thinks core business, policy makers deliver core competence to each ministerial desk and scientists study ever smaller segments of reality going into such detail that in the end they seem to know everything about "nothing" that matters to life to the millions of species that have made this Spaceship into their home. At the outset it is our belief that we have to proceed not with the blind acceptance of the existing laws of physics, nor with a deeper understanding of quantum physics or nuclear physics, but that we have to create this understanding of the basic principles of life at the crossroad of all three major disciplines physics, biology and chemistry, supported by the real of mathematics.

The law of thermodynamics comes from the world of physics, and it makes a lot of sense within the existing theoretical framework. However, over the years to come we should deepen our understanding of the laws of life that integrates to the best of our understanding of physics, biology and chemistry. The real contribution from our new insights in physics may well come from nanoscience, especially the structure of water at its inter-phases. We should try to better understand how does nature thrive on chaos, and what kind of a system is likely to permit better livelihoods for all living species on Earth.

This is likely to be an open system, with non-linear mathematical behavior that could even be the merger of all three scientific disciplines into an overarching framework without the theoretical conflicts that characterize Quantum Physics and Newton. Thanks to two untapped energy sources, provided by the sun and the never-ending power of interplanetary magnetism, life on Earth converted and continues to convert chaos into order. Living systems convert inorganic particles into self-assembling organic structures, using infinitesimally small chemical reactions performing nanotechnologies we cannot even imagine. This is all happening right before us. Whereas we see the isolated breakthroughs in understanding, we are lacking the integrating wisdom.

"Why don't we stimulate a debate about nature's systems for making order out of chaos?"

—Prof. Dr. Carl-Göran Hedén, Chair of the ZERI Scientific Advisory Council (1994-1997), Member of the Swedish Royal Academy of Sciences

By 2014 we may have a better understanding how nature generates chaos and captures all forms of energy, even the ones that we have not yet been able to observe. Perhaps we have more questions than ever before. Though one thing is certain, unless we are prepared to imagine the unimaginable we have to simply accept that in a closed system ultimately all will turn into chaos. We are living in an open system, and therefore we have an obligation to construct the framework for life in it, including human life. Therefore we should attempt to create a theoretical and practical framework that states that "autopoietic systems incessantly enrich life by converting any chaos into structure".

### 1.2. The New Axioms of Economics and Management

The debate about theory and science has to be complemented with another debate about economics.

The past decade offered us a chance to see what many had felt for years: the economic and management system based on core business and driven by cash flow analysis is not able to respond to the basic needs for all. This economic system may be the best we have been able to imagine until today, but it is one that sustains poverty, degrades our environment and only reacts at times of extreme crisis. Even with over 100 international environmental treaties, the Kyoto Protocol in force, even with environmental reports from all major multinational corporations, even with that buzzword of corporate social responsibility, the reality is hard: billions are left out, waste continues to pile and destruction of the habitat on which we so depend continues. The core business, core competence, outsourcing, globalization, supply chain management buzz has to evolve like everything evolves over time into a better system. We submit that we need a market system that responds to the needs of the people and that produces what they really want.

Therefore the 12 axioms of economics and management written on the basis of a series of ZERI case studies for the World Congress in 2004 were a first attempt to distill that new framework. We have to broaden these observations of the economics that permit us to respond to the basic needs of all with what we have, in particular our culture, traditions and ecosystems. We must test and improve the ideas, engage in a never-ending quest to imagine that economic system that is indeed creative and innovative, where leadership thrives and risks are taken for the betterment of all. This will require input from many creative thinkers, preferably those who have never studied economics before.

### 1.3. The Biomimicry of Systems

The opening statement of ZERI in 1994 was "Nature does not know the concept of waste". If one takes the time to simply sit and look at the marvels of nature, it is impossible not to be fascinated. If one just sees what is out there, one cannot but sense so much respect and admiration.

"Nature runs on sunlight. Nature uses only the energy it needs. Nature fits form to function. Nature recycles everything. Nature rewards cooperation. Nature banks on diversity. Nature demands local expertise. Nature curbs excesses from within. Nature taps the power of limits."

—Janine Benyus in Biomimicry, Keynote Speaker at the 10th Anniversary World Congress on ZERI

But the goal is not to turn Nature into a zoo or a park in order to preserve what we have and understand. The goal is to become a mature partner in these networks of ecosystems thriving with life. The human species is a very recent arrival on this Earth, and it is therefore understandable that this species has yet to learn how to fit and adapt to the never-ending changes of this autopoietic system called Earth. Janine Benyus introduced the world to the concept of biomimicry, and a great sense of responsibility welled up: this cannot be the biomimicry of the core business and the core competences where all is taken out of context to meet short term financial goals and to make abstraction of natural systems.

The third area of research, and the next subject for an intensive learning process through dialogue is therefore on the "Biomimicry of Systems." This includes the design of components, the design of processes and ultimately it considers these first two aspects and places them into the overarching design of a system. The ZERI network is committed to understand the interplay of species, the cascading of biochemical processes and reactions, the integration and separation of materials, the intertwined production and consumption of energy. All of this works, is complex, so self-evident and yet so little understood. This research will offer us inspiration on how to convert our present engineering (driven by the laws of physics and economics only) to a generative process where not only waste is considered a resource, but also how we can engineer the framework conditions so that simultaneous self-assembly and self-disassembly functions forever. This way of thinking permits us to look at Nature as a resource and a reserve that is always progressing toward more efficient, more diverse, systems of production and

consumption with more joy and variations of beauty than ever before. This "systems" approach to biomimicry can thus look at product and form, at process, as tools with recipes, and it will study the interrelations amongst all that are part of the networks within the ecosystems.

The Biomimicry of Systems will undoubtedly lead to more profound insights and will thus contribute to the debate about open systems and their capability to create diversity out of simplicity. This debate will certainly oblige us to readjust and finetune the design principles as well as the axioms of economics mentioned before. It is Tao of Bios that will complement the Tao of Physics. Let us look at reality of life from all sides but promise we will start with open systems characterized by autopoiesis.

How many people know what we are talking about? This tremendously challenging debate and dialogue around the three themes cannot remain the realm of a happy few. This dialogue will have to be undertaken in parallel with major educational initiatives. It is impossible to learn only through dialogue and experience, we do learn most when teaching!

## 2. Educational Initiatives

If we only teach our children everything we know, then they can only do as bad as we are doing. Therefore, educational initiatives will be part and parcel of the next decade, covering all age groups but dedicating at the same time special efforts to the youngest and the most professional.

### 2.1. From Fairy Tales to Reality

The years after the World Expo in 2000, the fairy tales became the basis of the ZERI Education Initiative. The 36 fairy tales wonderfully illustrated by Pamela Salazar Ocampo, are published in 2005 in one book and are but a starting point. Over the next decade we should at least have 100's stories bringing fun, surprise, and startling ideas on how to make this world the most magnificent place to be our best. The opportunity to share the initial experiences in Brazil, Germany, USA, Japan, Ecuador, Egypt and Colombia will give rise to more publishing initiatives, a drive towards the production of animated movies, the design of electronic games and the redesign of our whole educational program, not more - not less.

The ZERI network will reserve more time for education, i.e. education of the third type: inspiration. And based on the experience of Japan, the education initiatives will be carried forward by more dedicated teams as the combination of project implementation and teacher training are not always compatible. We have to create space for creative insights into the same realities and it is our commitment to make it happen. The design of a special website, and the creation of additional material broadening the scope for participation of teachers and students is but the first step forward. This could be one of the ZERI projects that is spun off in a separate unit globally.

### 2.2. A Network of Graduate Schools

Though, the explicit commitment to work with children from kindergarten onwards may not be interpreted as a write-off of our present generation: the young who just graduated from high school, and the ones who are making day to day decisions at the business and policy level operate within a framework that is not able to respond to the basic needs of all. Therefore ZERI commits to the creation of a series of Graduate Schools. The first one is the Graduate School for Systems Design at the Science University of Turin which eventually will spin off in a separate institution. This European school will start in October 2005 with 50 students for a two year master program with the possibility to continue with a PhD. The learning system is based on intensive classes and extensive field studies. The students will only have 20 professors per year and will have each professor exclusively for one week. Professors will not teach from their books. There is no need to since the students will have read all available material in advance.

The learning process is a Socratic dialogue started in Italy but will expand to other continents. The Master of Engineering of Natural Systems is a second one already in advanced discussions in collaboration with the Universidad de la Sabana in Bogota, Colombia. A third unit is under consideration in Cape Town, South Africa. In this way we are planning to build the network gradually but consistently. The different schools are to be interconnected through courses and field trips but the one integrating factor will be the graduate thesis is the symbiosis of all one has been exposed to with the vision of the person's energy and commitment. We may even create a completely new university in the middle of nowhere at... Gaviotas for opening in the Fall of 2006.

### 3. Project Implementation: From Idea to Implementation

It is not possible to separate idea from education, and neither can ideas be separated from action. As the concept of the five intelligences explains: what is the use of all the academic knowledge, all the arts, the emotional intelligence and ecoliteracy if we are not able to undertake the most important step of it all: implementation.

#### 3.1. Move from Living Laboratories to Megaprojects

Since its creation, ZERI cannot be separated from project implementation. ZERI will have to carefully choose where it will invest its energy and resources. It is a non-organization without headquarters, but rather through a network of operations. The challenge is to convert ideas into pilot projects, and move through living laboratories into megaprojects. We have to avoid too high expectations that outsiders will do the job. Actually, ZERI has done very little but to assume the role of the catalyst, or the enzyme. We always rely on local resources, human resources in the first place.

There is no doubt about it, a series of microprojects may spread the risk, but it does not offer the platform needed to move towards a better society and community at the pace that is needed. There is a need to move forward fast track. Thanks to the remarkable and practical case provided by the pioneering leaders such as Paolo Lugari in Colombia and Ashok Khosla in India who independently created a reality. These examples represent a bath of inspiration and scientific evidence. Now one can indeed attempt to move from a living laboratory to a megaproject on the condition that we take a long term view and proceed only by choosing a direction not a model. We must take time to build dedicated teams to implement the project over time. And we must take the time to inspire that team to implement a vision that goes beyond what is considered possible today.

If there is going to be a real difference on the ground, then it will be thanks to the citizens of the world who simply took the initiative, without waiting for the funding from elsewhere, or the government approval. They went ahead and did it, and did it on a big scale. Once the train leaves the station, from our experience, there are few who want to be left out. It is the laying of the track and the self-powering of the engine that is the key to success. Large scale projects like Gaviotas II may succeed or may fail, but the fact is that thanks to the Gaviotas of Lugari that everything can be done differently from now on. The project of Gaviotas I looked like utopia a decade ago, today it is reality. It is this reality that permits us to imagine a new utopia.

#### 3.2. Product Cascading

The ZERI concept started with the desire to change the production system. Time has come to dedicate equal effort to the design of a consumption system, which reflects the real opportunities offered by natural systems. That is why the design and the implementation of mega projects must be complemented with an innovative marketing campaign aimed at bringing the systems to the household. The concept of product cascading will be strengthened and a series of partnerships with marketing and distribution companies are to be launched to sell the products of these systems in systems: if one grows

coffee organically then you need herbs to control pests (herbal teas), if you avoid soil erosion, then you plant soil stabilization bushes (herbal teas), you need shade offered by plaintains (dehydrated snacks), and you have coffee waste that is a substrate for tropical mushrooms (dehydrated mushrooms). Time has come to sell the consumer (1) organic coffee, (2) herbal teas, (3) dehydrated bananas and (4) tropical mushrooms in one set. After all these is the produce of the ecosystem. When production is part of a system, then consumption will also have to become part of a system.

### 3.3. Innovative Financing

The design and implementation of grand projects for which there is no experience, can only succeed if there is a solid financial strategy backing it up. This does not mean that the project is fully funded and has cash on the account prior to its initiation. This rather implies that one knows how to generate the cash flow needed to operate and expand this venture. One cannot rely on the same and simple mix of lending, micro-credit, soft loan, donations, technical assistance and government guarantees that have proven to be insufficient to overcome the massive gap between rich and poor. The generosity of a philanthropic foundation and the goodwill of governments is welcome and needed, but needs to be complemented and perhaps even superseded by smart financial engineering.

Over the next decade ZERI should put much more substance to the concept of "smart purchasing." Companies should be able to buy from suppliers who are systems-based producers of raw materials. Those who buy coffee from a farm that is also producing herbal teas organically and do as described in 3.2 are putting their buying power to use. These companies engaged in smart purchasing are not just respecting the natural environment but these business are on a co-evolutionary path with nature, and who do not only respect indigenous knowledge and cultural traditions, but which thrive on these, and more. ZERI could play a role in a completely new financing system, combined with an innovative labeling system that stimulates innovation and has the needs of all species in mind.

### Conclusion

The outline of what the next 10 years are all about is enormous, overwhelming and yet limited. It is over-ambitious and even a pipedream if this 10 year vision relies on the energy of one individual. But if there is a team, a well distributed team with the right level of enthusiasm, then one can indeed apply the Law of the Least Effort: "The right time, the right place and the right people" will join efforts in order to make it happen. This 10 Year Vision equals a commitment of the ZERI network that includes research and dialogue, education and action. Over this period of time, starting from 1994 and ending in 2014, children will have become adults and start taking their action on the ground, their way. It will be exiting times and we are delighted to have been blessed with so many who care about the work we do. And, it is only just the beginning.

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