



Danilo Capellini



William



Isabel Mañana Díaz

Riccardo Bazzali

Responsable for Agricolture, Aquacolture and Wastewater



Paolo Berni



Pier Gino Megale

Responsable for HVAC, Water and Power Plants



Sandro Foce







# Naturally...

### ... SIMPLE

Our proposal aims to reproduce the nature whith simplicity, in an easy to build and easily reproductible way.

The whole structural system is completely based on steel structures. In this sense it is easy and fast to build. The structure's configuration imitates nature's simplicity, reproducing a natural and efficient form in vertical.

### **LUXURY AND COMFORT**

### ... SUSTAINABLE

Our proposal is socially, environmentally and economically *sustainable* through *innovation* and efficiency.

The developed technologies are certified at the highest world standards, such as LEED and BREEAM.



### **GREEN BUILDING**



Our proposal is a "unicuum" of technology and science.

Envelope and technology work strictly together, in a union that ensures the highest levels of efficiency in production, maintaining the highest standards in environmental sustainability.

### **ZERO KM ORGANIC FARMING**

## ... INNOVATIVE

Our proposal is totally *innovative*, using a *new cycle of production* and the latest technology on renewable energies and sustainable materials.

The elaboration increases the production and profits keeping the waste to minimum. The architecture ensures the precise conditions for this production to take place minimizing the cost of energy by using renewable sources.

### **ADVANCED TECHNOLOGY**



### ... UNIQUE



Marine engineering & Offshore

THE MATHEMATICAL'S SHAPE IN NATURE The project is more than a zerokm production system.

> Totally in line with our conception of **thinking locally** to act globally, here we present a different kind of vertical farm, where not just one or more big farming companies grow crops and sell their products, but there's space for everyone to buy their own space and grow their own vegetables and fruits.

> The project combines economic, social and environmental sustainability. It is not only a farming space, but an area where everybody (owners and public) can relax, spend time, enjoy one-another in total freedom, sell and buy products, taste new flavours, learn more about nature.

> The idea of balance between man and nature, between building and environment finds its natural shape in the Fibonacci Sequence, the sequence that's for excellence the rule of harmony in nature.

 $F_n = F_{n-1} + F_{n-2}$ ,  $F_0 = 0$ ,  $F_1 = 1$ 0, 1, 1, 2, 3, 5, 13, 21, 34, 55, 89, 144, ...

Leonardo Fibonacci was an Italian mathematician, considered by some "the most talented western mathematician of the Middle Ages". He is best known to the modern world for the spreading of the Hindu–Arabic numeral system in Europe, primarily through his composition in 1202 of Liber Abaci (Book of Calculation), and for a number sequence named the Fibonacci numbers after him, which he did not discover but used in the Liber Abaci.

When falcons make a spiral down to their prey the flight path which offers least resistance and that allows full view of their prey at all times is the Fibonacci's spiral.

# ...the Idea

# FIBONACCI'S SERIES





# **The Concept**

# *5 TERRE* (UNESCO World Heritage sites) THE MOST ANCIENT NATURAL VERTICAL FARM

We can find the building's proportions in the Nautilus shell shape, as well as in Sunflowers' calyx, in the falcon's fly path, in the human body proportions and in many other things. With this idea of balance, we developed the **Fibonacci Shape in vertical**, giving it the third dimension, taking it to the sky, and doing a little more: establishing a connection between the harmony of nature and what of nature we have in our DNA.

Our inspiration, our territory. Unique human and natural environment, **Cinque Terre** (*Riomaggiore, Manarola, Vernazza, Corniglia, Monterosso al mare*) are one of the main treasures of **Italy**, a space tight between hills and sea, a tough land where, with limited resources of space and water, wise men found a way to cultivate crops and live their life in total harmony with nature. We want to reproduce, in this **green skyscraper**, that idea of **efficiency and harmony**.

MANAROLA, CINQUE TERRE (ITALY)

#### MANAROLA









The building collects and treats, with a biological patent procedure, any kind of available water (wastewater, saltwater, etc) taking the most out of each drop. It contains not only the farming (open and indoor space) storeys, with all their system of sun oriented terraces, but multiple recreation areas, each of them including a botanical garden, a retail space plus outdoor green and walking spaces.

250 mt

0 mt

Vertical communications (stairs and lifts) find their space in the great column on the south side, just next to the main entrance. Every block of storeys contains two public spaces, three farming areas and a technical floor, where energy and the irrigation system are located.

This 250 meter-tall building is eco-friendly and zero-carbon productive, designed with an eye on pollution reduction and environmental+economical sustainability.

Electrical energy is provided by a system of vertical axis wind turbines (VAWTs) situated in every technical floor, and by photovoltaic panels distributed along the glass ribbon that embraces the building from top to bottom, shaped on Fibonacci sequence to maximize the sunlight uptake in all seasons.

Water is pumped and collected (after being treated) on the tower top and all over the ribbon's internal edge, reaching by gravity the distribution system on every technical floor; here it's purified, clarified and collected in tanks, ready to be distributed and used for irrigation. Natural air circulation is provided on every floor, as well as natural lighting.

Indoor areas are illuminated by a light pipe system, which brings natural light even to the north side of the building.







# **Sectors**





Restaurant Area and University of Taste, "luxury and delights", to see, to smell, to taste and eat, in total comfort on the top of the buil-

With the possibility of learning about the secrets of the different flavours. A cuisine that combines the **ultimate deliciousness** with the opportunity of eating products grown just "downstairs".

Organic Farming, agricultural activities' areas.

• Technical Floor with energy production system (Vertical Axis Wind Turbines), water pumping system, aquacolture structures;

• Educational Area, to learn and study the agricultural activity, the secrets of crops, the sunlight use and the technology of wastewater

• The Botanical Gardens, a recreational and educational area, open spaces where anyone can spend some quality leisure time.

• The Markets, open spaces where buying fresh crops and other pro-

• Underground Area (Wasterwater Management System).



## **FIVE SECTORS, FIVE LEVELS IN EVERY SECTOR...**

...five fingers in the human's hand, five villages (Cinque Terre), five numbers in the Fibonacci's Series:

- two levels dedicated to external farming, imitating the terraces in Cinque Terre;
- one level dedicated to botanical gardening, reproducing hanging gardens;
- one level for indoor farming, dedicated to production in different climate conditions and with new techniques, like hydroponic farming;
- one technical floor, to produce energy, for the wastewater managment and aquaculture.

### Floor Type E - Technical Area

Aerobic waste treatment Water tanks. Vertical axis wind generators Water depuration system Photovoltaic panels

### Floor Type D - Outdoor Farm

Hydrophonic cultivation system Soil cultivation area Terrace.

### Floor Type C - Indoor Farm Area

Hydrophonic cultivation system

### Floor Type B - Market Area

Terrace

- Botanical glasshouse
- Retail spaces
- Green area
- Terrace.

# Floor Type A - Farm

- Green area
- Retail spaces.
  - Terrace

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# Sectors' Detailing



# Medium Rise Farm

# 25 mt

0 mt



- Restaurant Area and University of Taste;
- Organic Farming, agricultural activities' areas.

• Educational Area, to learn and study the agricultural activity, the secrets of crops, the sunlight use and the technology of wastewater reuse.

• The Botanical Garden, a recreational and educational area, open spaces where anyone can spend some quality leisure time.

# 2<sup>ND</sup> SECTOR

• **The Markets**, open spaces where buying fresh crops and other products from the Vertical Farm is possible.

• Main entrance (Ground Floor, Fishfarming and aquacolture structures);

# **1<sup>ST</sup> SECTOR**

• Underground Area (Wasterwater Management System, energy production system, water pumping system).





#### SOUTH VIEW



#### EAST VIEW



#### WEST VIEW



#### NORTH VIEW









# **Zero Km Production...**





What we mean by zerokm production is that all the farming and its generated goods will be produced in the same place/city they will be consumed. We present an alternative to import. There's no longer a need to invest large amounts of money to bring great guality products from all around the world. They can be produced right here where you are, in your city, just around the corner.

The goal of this proposal is to bring high quality farm, botanical and **aquaculture products** to the neighbourhood in the form of a high rise building which at the same time aims to erect itself as an icon. The building will work as a green core inside the concrete filled city, acting simultaneously as a farm, botanical garden, market and social point.

One will be able to go to the skyscraper alone, with family or friends, to participate in the farming process, grow his own crops, buy some great, top quality, organic products or just to take a stroll and disconnect from the city's hectic activity. What we offer is the possibility of putting the cherry on top of what's generally understood as luxury. This is **another type of luxury**, the one that feeds the mind, the soul and, of course, the stomach.

# "NATURAL" LUXURY



To protect the environment, to defend food biodiversity, to promote sustainable agriculture, to support small-scale food producers and the values of their traditional knowledge. A truffle is the fruiting body of a subterranean fungus, some of the truffle species are highly prized as food.

#### **Beekeeping**

Bees pollinate a large variety of plants. The value of these pollination services is commonly measured in billions of dollars. Beekeeping can help generate many products and facilitate the pollination.

#### **Culinary Herbs**

The difference between culinary herbs and vegetables is that, culinary herbs, like spices, are used in small amounts and provide flavours rather than substance to food. Many culinary herbs are perennials such as thyme or lavender, while others are biennials such as parsley or annuals like basil. Some perennial herbs are shrubs (such as rosemary, Rosmarinus officinalis).

Some plants are used as both herbs and spices, such as dill weed and dill seed or coriander leaves and seeds. Also, there are some herbs such as those in the mint family that are used for both culinary and medicinal purposes.











The botanical and organic farming would generate products from all around the world thanks to the technology implemented in the building, which ensures the optimal conditions for the growing of any kind of crop. This is possible because of the separation of the species in different storeys.

**Imagine the luxury** it is to be able to get fruits such as the dragon fruit or the kiwano melon, and vegetables such as the peperoncino or tomatillos all throughout the year just around the corner. Not to mention a great international variety of flowers, plants and bonsai size trees.

Our system is also self efficient, a closed cycle in which all the needed energy resources are renewable and all the waste generated by either the farm, the botanic garden, the fish farming or even the visitors and workers, is responsibly managed and reused to produce more energy or help in the breeding cycle (zero waste).

An introduction of a technology of this scale would allow to have an important amount of cultivable land with minimum horizontal surface usage. In addition, transportation and logistics costs would be considerably reduced due to the fact that the farm would be placed within meters distance from the consumers.

# ...Organic Farming

This skyscraper is also eco-friendly, a physically and functionally green building, socially, environmentally and economically sustainable through innovation and efficiency.

Our proposal is totally innovative, using a new cycle of production and the **latest technology** on renewable energies and sustainable materials.

The elaboration increases the production and profits reducing the waste to minimum. The architecture ensures the precise conditions for this production to take place minimizing the cost of energy by using renewable sources.





# Sustainable Aquaculture

Aquacolture units take most of necessary fish food from farming wastes, while providing nutrient rich water to feed back the plants. The interaction between animal and plants creates a natural cycle where almost water and energy are wasted.

# **STRUGEON & CAVIAR**

The area dedicated to sturgeon fish farming aims at the creation of a sustainable process for the breeding of the Sturgeon, **to produce high quality caviar and fish fillets**. The sustainable farming system is based on the possibility of raising the Sturgeon using a system of rearing based on the **recycle of water**. The principle of water recirculation in fish farming, offers four opportunities:

- elimination of the environmental impact of fish farm production;
- "appropriate" use of fresh water, 15-22 ° C;
- production of high quality caviar and fish, both for the internal market and for export, where quality plays an important role in the creation of the condition of the market a n d gets higher prices.

• realization of an agro-industrial sturgeon breeding system for an optimal dimension of production of caviar and fish.

Original caviar is a high quality product of great luxury and prestige.

In ancient times, strength, physical resistance and even healing properties where attributed to this bite, which is, nowadays, a gastronomic piece of jewellery.

What may be less known about this product is that it has fabulous nutritional properties, it's full of energy, and rich in proteins, minerals and vitamins.







## TILAPIA

Aquaculture is developing very fast all around the world due to the combined action of a big increase in the fish market demand and the exhaustion of the fish population in the oceans.

The space dedicated to the breeding of Tilapia aims to produce high quality Tilapia fish meat. The product obtained with our intensive farming generates a very competitive product, superior to the one obtained through other means.

What's more, our system, which uses the **recirculation of water**, has a zero impact on the environment. It can also be easily integrated with any type of heat source, for example, the ones used in the building: solar pannels and vertical axis wind turbines.

A place where you can buy **fresh crops** and other products from the Vertical Farm.

For instance the bees' production of Honey, a complex substance made when the nectar and sweet deposits from plants and trees are gathered, modified and stored in the honeycomb by honey bees as a food source for the bees. The Beeswax is a natural wax: small amounts of beeswax have food and flavoring applications, and are edible. The **Bee pollen** are marketed as a food, rather than a dietary supplement. The **Propolis** is consumed by humans as a health supplement in various ways and also used in some cosmetics.

Naturally it is possible to buy aquaculture products too, fresh or half-processed, like Tilapia or Strugeon fillets and Caviar eggs.

The Botanical Garden is a **recreational and educational area**. It consists of open spaces where anyone can spend some quality leisure time, between the different tree species, in the recreation and learning spaces which are designed for children and adults.









# THE BOTANICAL GARDEN



# On the Top, in the Sky

## THE RESTAURANTS

The Restaurants' Area, the place for "*luxury and delights*", to see, to smell, to taste and eat, in total comfort on the top of the building with a great panoramic view, where it is possible to eat and taste the Vertical Farm products, the **best organic** food from the agricultural and aquacultural activity inside the building.

A cuisine that combines the **ultimate deliciousness** with the opportunity of eating **products grown just** "*downstairs*", in a friendly, luxurious and confortable environment.

**Comfort and luxury** are ensured by high quality design, the use of natural materials, the minimum use of artificial lights, the shape of the building guarantees the best exposition to sunlight.

The **place of flavours** and taste, of good smells and colours, the triumph of senses and pleasures, with a magnificent view from the top of the skyscraper, and with the possibility of learning about the secrets of the different flavours.

The University of Taste is a place where **products and their trasformation join**, where **producers and consumers meet**, and where you can discover the tradition of the **crops and the food**.

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# **UNIVERSITY OF TASTE**



# **Vertical Farm, BioLandmark**

Our proposal aims to be a landmark, easily recognizable, a place of interest to tourists and locals, an icon. As a landmark, it works as a guide in the city, to help people orientate in a familiar or unfamiliar environment.

It confies identity to a certain area, providing character and memory to the environment.

But this isn't the classic landmark, this is a new concept, a super innovative skyscraper, with the latest tecnology reached by highest profile research, to produce food, from agricultural activities or fish totally self-sustaifarming, ning.

It's a "BioLandmark", being "bio" the greek root word for "life". In our skyscraper, life is a constant:

• Life in continuous generation and evolution in plants, fishes, vegetables, fruits and system of wastewater reuse;

• An improvement in the life of locals and tourists;

• A green lung that breathes life into the city;

• A social encounter point that brings life into the neighbourhood.

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# High Rise

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GOD

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STATISTICS.

N DESCRIPTION





# Medium Rise



# Tech. Performances





### FIBONACCI'S SHAPE AND SOLAR FEATURES

The building's shape allows it to get **maximum sunlight exposure**, like in a plant's phyllotaxis development, which is the arrangement of leaves on its stem. These feature helps the building have better day-light exposition.

In this manner, **crops will grow faster**, better and stronger and the **solar energy production** will be improved.



### WASTEWATER TREATMENT

The building has a wastewater treatment system, based on the **advanced technologies** of aquaculture, developed by Pisa University.

Water harvesting is the accumulation and deposit of water for reuse before it reaches the aquifer. Uses include water for irrigation or farming activity.





WASTEWATER COLLECTOR

### PASSIVE SOLAR DESIGN



Passive solar design is based on using the sun's heat energy and its predictable movements through the seasons, as the Earth rotates around the sun on its annual cycle, it is tilted at an angle on its vertical axis.

This impacts how the **sun's rays strike** various locations on Earth. Passive solar design uses the predictable movements of the sun to best utilize its energy within the building's overall design both for heating and cooling purposes.

### NATURAL VENTILATION



Natural ventilation is the process of supplying and removing air through an indoor space **without using mechanical systems**.

It refers to the flow of external air to an indoor space as a result of pressure or temperature differences.

The "Buoyancy-driven ventilation" occurs as a result of the **directional buoyancy** force that results from temperature differences between the interior and exterior.

WARM AIR EXHAUST

# **Renewable Energy Performances**

### **SUNLIGHT USE**



The Pipe-light system is a natural lighting system. It is a revolutionary new way to pipe sunlight in order to brighten areas where ordinary window lighting systems cannot reach.

The super reflective tube extends through adjustable bends and has an internal mirror finish that intensifies and reflects natural daylight delivering free outdoor light to a room or area below where the light is evenly diffused by a translucent ceiling fixture.

This device guarantees:

· energy saving with less use of eletrical energy;

 better environmental quality of indoor lighting;

 more sunlight in building areas which would otherwise remain dark.

### **PIPE-LIGHT PERFORMANCE**

## SOLAR PANELS COMPARISON

81° sun elevation 57° sun elevation

> PV performance with Fibonacci's disposition (Volts) PV performance with standard disposition (Volts)



A thin-film solar cell (TFSC), also called a thin-film photovoltaic cell (TFPV), is a solar cell that is made by depositing one or more thin layers (thin film) of photovoltaic material on a substrate. The thickness range of such a layer is wide and varies from a few nanometers to tens of micrometers.

 Outperforms conventional solar modules with equal power rating and proven energy yield advantage over conventional solar modules in hot climates;

system;

27° sun elevation 45° sun elevation

# THIN FILM SOLAR MODULE TECHNOLOGY

• World-record holder for CdTe thin film module (14.4%) and cell (18.7%) efficiency and smallest carbon footprint and fastest energy payback time of any PV

 Solar power plants in high-temperature climates spend the majority of their operational lives above 25°C, where CdTe modules have a proven performance advantage due to crystalline silicon solar modules.

### WIND TECHNOLOGY



Vertical-axis wind turbines (VAWTs) are a type of wind turbines where the main rotor shaft is set vertically and the main components are located at the base of the turbine.

Among the advantages of this arrangement are that generators and gearboxes can be placed close to the ground, which makes these components easier to service and repair.

VAWTs do not need to be pointed into the wind. Corso Nazionale, 288 - 19125 La Spezia (Italy)

phone **+39 0187 873872** fax **+39 0187 517696** mobile **+39 334 8477010** 

website: www.capelliniarchitects.com email: info@capelliniarchitects.com



