

Studies About Bamboo Landscape for Developing Countries

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***“Contribution to the eradication of poverty through
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in China and Mexico”***

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Abstract¹

How are we using the expertise of Landscape Architecture in order to solve relevant problems in the world? Bamboo landscape for developing countries offers two different stories, in two different regions separated by 13,000 kilometers, but united by a common vision: bamboo development.

In one hand, Sinaloa, Mexico. Located in the most important region of food production of Latin America, faces the challenge of climate change. Since 2009, unexpected frost winds are hitting the region burning 25% of the total crop production = 500 million US Dollar per year of lost food. In the other hand, Xinhua, in Central Hunan province, China. A magical region with 6,000 years of uninterrupted traditional culture. Renown by magnificent rice terraces and abundant natural bamboo resources, faces a massive cultural identity challenge. Since 1983, the accelerated economic growth of China is creating a premature development of tourist industry in rural Xinhua, within a regular migration of fathers of family going to cities looking for job.

Bamboo Landscape for Developing Countries offers one possible solution: bamboo development. For Sinaloa, Mexico, introducing Bamboo species as a main “cash crop” for food production aims to fulfill a 25% of the total production = 170,000 hectares of new bamboo forests in northwest Mexico. With market targets in south of USA, Mexico and Central America.

For Xinhua, China, learning to manage the local abundant bamboo resources, aims to bring families back together meanwhile integrating Xinhua into the 2.3 billion USD of bamboo industry in China. With market targets in Main China, Asia Pacific and USA as well.

Bamboo Landscape for Developing Countries designs two different pilot projects (one per region) with a common vision: bamboo development. Illustrating the potency of bamboo as a powerful ally for human kind in the unstoppable process of evolution.

As a consequence, the landscape sceneries of Angostura Mexico and Xinhua China will be strongly influenced by the socioeconomic aspects of the Bamboo and other complementary systems.

¹ Keywords: Bamboo. Landscape architecture. Developing countries. Global warming. Market economy. Poverty. Social business.

摘要²

我们如何运用景观建筑的专业知识来解决世界上的相关问题? 竹景观为发展中国家提供了两个不同的故事,在两个相隔**13000**公里的不同地区,但被一个共同的愿景联结:竹子的开发。

在一方面,墨西哥锡那罗亚州, 位于拉丁美洲最重要的粮食生产地区, 面临着气候变化的挑战。自**2009**年以来,意想不到的霜风正袭击这片地区, 烧毁的作物占生产总额的**25%** = 每年损失食物金额达**5**亿美元。另一方面,中国湖南省中部的新化县, 一个拥有**6000**年不间断传统文化的神奇地区, 因壮丽的水稻梯田和丰富的天然竹资源而闻名, 面临着一个巨大的文化身份的挑战。自**1983**年以来,中国加速的经济增长正在农村新化创造一个不成熟的旅游发展产业, 在那里, 常规的父亲家庭准备迁移到城市寻找工作。

竹景观为发展中国家提供了一个可能的解决方案: 竹子的开发。随着市场目标锁定在美国南部、墨西哥和中美洲, 对于墨西哥的锡那罗亚州, 作为粮食生产的主要“经济作物”, 引进的竹子品种旨在完成生产总额的**25%**=墨西哥西北部**170000**公顷的新生竹林。

随着市场也锁定在中国大陆、亚太以及美国, 对于中国的新化, 学习管理当地的竹类资源, 旨在让迁移的家庭回乡重聚, 同时, 使整个新化进入中国**2.3**亿美元的竹工业生产行列。

竹景观为发展中国家设计出两种不同的试验性方案(每个地区一个)有着一个共同的愿景: 竹子的开发。说明在无法停止的进化过程中, 对于人类, 竹子的效力相当于一个强大的联合。

因此, 墨西哥的安格斯图拉和中国新化的竹景, 将被竹类的社会经济方面和其他互补的体制强有力地影响。

²关键词: 竹子; 景观; 建筑; 发展中国家; 全球变暖; 移居; 市场经; 社会商务; 贫穷。

For a successful development of our communities, it won't be the money what will make the main difference, but the care for planning and design of environments with social business mind-set. It is a fair landscape architecture that, irrespective of the social and financial status, motivates to a technical development of traditional building methods, instead of advertising the consumption of expensive and imported materials. Yet directing design to contemporary and comprehensive process.

With our planet's limited resources, it is not possible to build for seven billion people safe and good infrastructure in steel and concrete only. Infrastructure, like anything else (the landscape or our own body) is eroding over time. There is no material that stays forever. We are in true harmony only when we build in a way that respects and adapts erosion rather than fight it.

Globally seen we have two main challenges: food security for a growing world population and to supply safe and adequate habitat for everyone. In general, these two needs are in severe conflict with each other. Utilizing local natural materials, such as earth or bamboo, offers one possible solution. Understanding the holistic circle where life and death belongs to each other.

The ability of infrastructure to go back to earth without harm of the environment is something positive. In that sense, when only the know-how and skills remains from a building, it is essential to combine the construction process with a training of local craftsmen.

In order to anchor these beliefs in contemporary architecture we need pilot projects like the School of the Waters in Colombia, the Green School in Indonesia, the Duck Shelters in Zhejiang, or the Xinhua Bamboo Architecture Program in Hunan, China.

Design education has to ensure young designers have the capacity to bridge the gap between design and construction. Designers must be trained sufficiently to achieve positive change for people living in undeserving conditions. Understand the nuances of diverse sites and territories, and communicate more profoundly with local communities and stakeholders. In short, instill a greater social empathy. Manual skills must be developed on the same footing as digital and intellectual skills. Designing the right process must be equally important as the outcome. But, before take any action is highly recommendable to go deep into a holistic understanding of our global context in order to take local action.

Source of the topic

I got involve with bamboo in 2007, when I participated the urban planning to regenerate an important part of a world class touristic destination in Mexico: *Playa del Carmen*³. Urban bamboo farms were proposed as part of a strategy to integrate the fragmented society. In this experience, bamboo revealed to me as a powerful ally to solve problems in a reliable way. Not only in an urban scale but also smaller scales such as housing, pavilions or even daily life products. In 2011 bamboo took me abroad to Colombia, where I was mentored by famous German architect, Jorg Stamm, whom certified me as a bamboo construction instructor. When I came back to Mexico, as a bamboo construction instructor, I quickly integrated to the Architecture department of Botanical Garden of Culiacan, the most important and beautiful botanical garden of Latin America.

It was in 2012 when Chinese government invited me to participate in the Technology Training Course on Bamboo Cultivation, Processing and Utilization for Developing Countries. Sponsored by the Ministry of Commerce and organized by CBRC China National Bamboo Research Center, from June to August, 2012 in Hangzhou, China. The goal of participating in this 3-months' international forum was to explain to China's staff the forestry situation of Mexico focused on bamboo development; also, to receive a comprehensive training on the Bamboo System in order to adapt it into our developing countries. In this trip I got closely related to two key characters: Dr. Ding Yulong (Nanjing Forestry University) and Dr. Wang Guo An (Zhejiang University). Because my background an architect and my strong interest about bamboo, participating in the Landscape Architecture Master Program in Nanjing Forestry University promised to bring benefits for both China and Mexico. Dr. Wang Guo An strongly recommended me to participate in the Master Program on Landscape Architecture at NJFU. This is how the thesis *Bamboo Landscape for Developing Countries* was born.

So, I came back to Nanjing in October, 2013. The original thesis was focused in developing only the Angostura Sinaloa Mexico region, which already had enough content. However, during my stay in China, I experienced a particular situation in Xinhua, Hunan. In the summer of 2015 I was invited by Dr. Wang Guo An to participate as a volunteer English teacher in a beautiful rural region in central Hunan Province. Even though my task was to teach English to children, the government forum asked me if I had any suggestion to develop education and tourism in the region. But I only had one question: "Why if Xinhua has such rich natural bamboo resources, there is no use of it at all? China is #1 exporter of bamboo products in the world". The question was as seriously taken. Two months later I was invited again. This time not to teach English, but to discuss exclusively about the possible development of bamboo system in Xinhua. So, I found deeply interesting to compare the individual situations of Sinaloa Mexico and Xinhua China, in order to illustrate how the bamboo system can radically improve the quality of life of habitants, and contribute in the eradication of poverty. I, my self, am witness in the flesh in this issues. In that sense, this thesis is a holistic compilation of information directed into the must physical manifestation of our thoughts as society: the landscape and its architecture.

³ Playa del Carmen, Quintana Roo, Mexico. Located in the Mayan Riviera in the Mexican Caribbean, one of the most visited beaches in the world.

Significance of the topic

Well... when food supply is in danger, we have a problem (Angostura, Mexico). When one of the oldest traditions of this civilization is about to forget their roots, we have a problem (Xinhua, China). Yet, these issues are happening in the same planet. Fortunately for us, we are now in the information era. So, we can acknowledge each other with incredible velocity about how to act in order to adapt into our always changing environment. We find truly significant the fact that two different regions separated by 13,000 kilometers can dramatically improve the quality of life of their habitants, yet benefiting ecology; simply by aligning in cooperation with nature, in this case, bamboo.

Nowadays we might find several methods and systems for energy supply and material resources. We might satisfy our human necessities. But just a few of them can truly be called "sustainable". Understanding sustainability in the following equation:

(Cultivation, Processing and Utilization) x (Economy, Ecology and Society)

If any of these aspects are not in harmony, then, sooner or later, system will collapse. Only when we take care about the balance between them we can aspire not only to survive, but to evolve as specie. In this sense, bamboo is one of those few allies that are capable of fulfill the equation in a positive way. Study cases are numerous, and people believing about bamboo potential is growing year by year, so fast, all over the world.

(CPU) x (EES). How useful is this equation when designing our societies? Considering this equation, we can inform our design decisions and achieve accurate results.

Its said that human kind affect and impact the environment. We hear a lot that human kind is the principal responsible of global warming, specially because industrial activity since last century. However, most of the time we ignore that the planet has been in constant climate change, much more time before we even exist as specie. So, in this sense, global warming is not new at all. Still true that we do affect the environment with industrial activity, three logging, and so on. But, if we can damage, we can also cure, regenerate and create life. If we can log three forests, we can also create new forest. If we will affect the planet anyway, let's do it in a positive way. Let's create and manage enough biomass that will sustain our existence at the same time that the environment is significantly improved.

This topic also aims to contribute in the consolidation of the bilateral relationship between China and Mexico. As we are in a globalized world, with internet and airplanes, the capacity of response is more and more accessible each day. Our biggest challenge is, perhaps, to get over the language and cultural barrier, in order to strength cooperation and, together, eradicate poverty in our societies.

1. Global scenery

All the problems that we see right now are emerging from many many years, but now it come into a pick. Poverty, erosion, global warming, economy crisis, energy crisis, food crisis and all those things. The current system or structure that we use right now as a society is not going to deliver the result that we desire. In order to a new world to emerge we need a new structure. In order to contextualize our research direction, is essential to quickly explain our understanding about the circumstances that must be considered in order to inform our design decisions. These circumstances are closely linked not only to architecture, landscape or environment. It is a wide spectrum of interrelated sectors where each one is fundamentally important, and one can not exist without the other. These 12 sectors are: arts, economics, education, environment, governance, health, infrastructure, justice, media, relations, science and spirituality. So much can be said, however here are just two sub-topics to reflect the whole picture: poverty and global warming.

1.1. Poverty⁴

Among many problems, there is one problem relaying among all the problems of the world. It is all about making money. Nowadays money marks how successful we are. We are not taking for granted the following question: Why so little people have so much, and why so many people have so little? If we can take action in our design decisions from questions as fundamental as this, then we have a chance to conceive accurate results in construction and usage.

For 90% of world's population life is not about thriving, it is about surviving, just trying to hang on. So, did the Universe labored through 40 billion years only to bring the specie that will be his own enemy destroying his own home? Is this really the best we can do? Is it even possible for humans to thrive? If so, why aren't we?

In that sense, it is important to figure out what's happening here and now, since it seems we have been blinded to our brilliance, ignorant of our genius, unaware of our true power and magnificence. If we are in a world that sustains it self, why is unlimited energy not available? Well... if a story doesn't make sense, follow the money. Here some history.

1.1.1. Nikola Telsa and the Wardenclyffe Tower. Is 1901, Long Island, New York. Scientific Nikola Tesla manufactured the Wardenclyffe Tower Project, which produced free wireless electricity energy. However, his sponsor John Pierpont Morgan (who had the monopoly of combustion energy distributed by cable lines) recognized Tesla's project could transmit electricity without cable lines, representing a threat to the maximization of profit. After that, Tesla was put down and this technology remained hidden for more than one century, until now, in the internet era. Tesla proved that we live in universal abundance and freedom. But, why was this technology suppressed for so long time? Energy is the one and only industry of the world. If energy is free, then good-bye to large corporations such as, oil, coal, cable line electricity, etc. 200 trillion-dollar industry.

1.1.2. The green revolution of 1970⁵. In the 1970's the green revolution was set up by John D. Rockefeller (the first billionaire of America). This "green revolution" begun to utilize large fields of a single crop utilizing fossil oil energy resources through the biggest corporations (Cargill, DuPont, Continental, Monsanto, Bunge). Enormous new profits from the oil industry in the name of health and food supply. However, the true costs can now be seen.

⁴ Definition of poverty: The lack of access to information and energy.

⁵ "Who controls the food supply, controls the people. Who controls the energy, controls the whole continents. Who controls the money, controls the world" Henry Kissinger (1973).

Besides the destruction of biodiversity, in 2010 was recorded that 1 out of 7 people in the world did not have enough to eat. Corporations tendency is to make people depend even more in corporations while stablishing ridiculous regulations such as patenting seeds as private intellectual property (free trade of seeds would never happen again), or even utilizing genetic engineering to control human birth.

1.1.3. The monetary system⁶. When anyone applies to the bank for a loan, the only thing that the bank do is a digital transaction saying that now you have a new amount of money. They don't print new bills, nor the gold reserves grow anyhow. They just add a digital number from no where. In that very moment you begin to pay interests from a money that didn't exist and still doesn't. So, inflation would be eternal and national debts unpayable, making people literally financial slaves to pay something that can't be paid. When the first banks appeared, their original function was to save the population's gold bars in exchange of receives (the first bills). This was because gold was too heavy to carry, and it has been the more stable exchange tool since always. Once banks accumulated enough gold, they had the idea to offer loans for a small percentage of interests as a service payment for the loan. That's how the eternal inflation was born.

1.1.4. Re-evaluation of money. One of the more recurrent topics in population conversations is about our global economic situation. What's really going on with the economy? Are we in the process of recovery? Are we in the path of an even greater catastrophe? Or is it perhaps something else entirely? Well... we see very probably a new humbler, more peaceful role for the USD, and possibly a new role for you and me. Here are some facts to provide critical background. First, the BRIC countries (Brazil, Russia, India, China) have been developing

1.1.5. the New Development Bank with 100 billion dollars in gold stock and another 100 billion dollars in reserve. Specially China and Russia have been doing about 40 deals during the last years, on oil and technology in their own currencies and gold. They are not using USD for that. These recent investments are quite significant. China still holding 1.3 trillion-dollar debt in the Federal Reserve (the second largest in it self). However, China has begun to sold USD bonus rather than buy more. China also launched the Shanghai Gold Exchange to bring integrity to the gold market. In resume, the BRIC group is building a more transparent, honest, inclusive and sustainable economic alternative, as far as we can tell.

1.2. Global warming

Ok, first a few bad news, but later many good news. Promise. In the last 15 years this topic has been matter of attention in general public. A lot of polemic and speculation is out. Three general versions about it. First version; there is no global warming at all. Second version; global warming is produced by human industrial activity. And third version, the planet has always been in a climate change process and human is not responsible of it. Well, we can discard number one because global warming is actually happening and there is more than enough documentation about it. However, number two and three still in controversy. Both might be happening simultaneously in real time. So then, three questions we ask to answer.

⁶ "It's well enough that people of the nation don't understand our banking and monetary system, for if they did, I believe there would be a revolution before tomorrow morning" Henry Ford (1922).

1.2.1. Facts about global warming

When we look up to the blue sky, we have the sensation that it is an infinite space beyond the universe. However, it happens to be a very thin layer that protects us from space radiation. It is true that planet Earth has always been changing climate and evolving on its geology; however, also is true that since human industrial activity producing carbon emissions from fossil fuels has been in constant increment. Yes, is a big planet, but when an equivalent amount of energy of one atomic bomb is liberated 40,000 times a day, the thin atmosphere might be not that big.

Especially after the end of World War II, these global carbon emissions from fossil fuels have been dramatically increasing from 2,500 million metric tons of carbon in 1950 to 10,000 million metric tons of carbon in 2013. Suddenly, in 2016 was recorded the hottest month ever, 2°F above average. This increment in the average temperature of the world is aligned to some worldwide extreme weather catastrophes including floods, mudslides, storms, droughts, fires, extreme temperatures and more. Let's take a look to some of them:

Drought. Global warming is making significant changes in geopolitical orders. For example, the 2006-2010 drought in Syria turned 60% of their fertile land into desert; so then 1.5 million people migrated into Syria's already crowded cities.



Figure 1: Blue sky. Photo by NASA. (2012)

Diseases distribution. An other notable change regarding global warming is the worldwide distribution of tropical diseases such as Zika Virus, Dengue Fever, Cryptococcus Gattii Fungus, Chikungunya, Chagas Disease, West Nile Virus and Rift Valley Fever are being widely distributed. Of course the transportation revolution has a lot to do with this, however, the creation of the viruses is considerably stimulated by the global warming.

Migration of animals and plants. The land-based animal and plant species are now moving pole-ward at a rate of 15 feet per day, all guided by their natural climate conditions to survive.

Sea rise level. On December 29, 2015, the same storm that caused massive flooding in the US drove temperatures at the North Pole 50°F higher than normal to above the freezing point. It means that if the frozen poles are melting then the level of sea is rising.

The top 10 cities at risk from sea level rise in 2070 by population are: Kolkata, Mumbai, Dhaka, Guangzhou (10.1 million people), Ho Chi Minh city, Shanghai (5.6 million people), Bangkok, Rangoon, Miami, Hai Phong. And the top 10 cities at risk from sea level rise by assets at risk are: Miami, Guangzhou (3.4 trillion USD), New York, Kolkata, Shanghai (18 trillion USD), Mumbai, Tianjin (1.2 trillion USD), Tokyo, Hong Kong (1 trillion USD) and Bangkok.

In resume, the cost of carbon emissions involves: political instability, floods and mudslides, wild fires, drought, storm damage, ocean acidification, infrastructure loss, climate refugees, species extinction, melting glaciers, famine, water scarcity, ecosystem loss, our way of life, infectious diseases, sea level rise, and much more. According to the central banks, the cost of carbon emissions is the #1 threat to the global economy. So, the answer to our first question: *do we really have to change?* Is definitely yes.

1.2.2. Environmental revolution

Actually, in the last 10 years, amazing improvements in our energy industry have been achieved, specially in the wind, solar energy and bamboo technologies. In 2014 we just crossed the line where green electricity is cheaper than electricity burned from fossil resources. And this is why: The total of fossil fuels burned from 1850-2010 are 1821 Gt CO₂ from which only 540 Gt CO₂ have been burned in the last 15 years. Today, the remaining proven fossil fuel reserves are 2795 Gt CO₂ from which only 750 Gt CO₂ are burnable in order to preserve the possibility of limiting the heat increase to 2°C. When it comes to money, it means that \$22 trillion USD are unburnable.

The global wind energy capacity has been increasing from 10 Gigawatts in 1995 to an amazing improvement of almost 400 Gigawatts in 2014. At the same time, the wind energy cost has been dramatically decreasing from 300 USD per Megawatt Hour in 1984 to 20 USD per Megawatt Hour in 2014. In the other hand, the cost of crystalline silicon solar cells has been constantly reducing from 79.4 USD/watt in 1976 to 0.69/watt in 2014. In 2002 the solar energy market was projected to grow 1 GW per year by 2010, however, in 2015 the reality exceeded by as much as 68 times the initial expectation. Germany generate a media of 24% of its electricity from renewable sources, however, only on December 26, 2015, Germany generated 81% of its electricity from renewable sources. And countries with much less income such as Sudan or Bangladesh have been implementing new Social Business Models to afford solar power with low initial costs. Pay-as-you-go solar power. But,

Well, in 2014 was recorded a global investment out of 391 billion USD for clean energy and low carbon applied technology, from which 148 billion USD (38%) was from the public sector, and 243 billion USD (62%) from private sector. If we compare this investment against the investment in fossil fuels, we find that only in 2014 the renewable energy investment almost duplicates the fossil fuels investment.

In resume, the cost dropped sharply, as the quality improved dramatically, and all the low-income nations with no land-line grids leap-frogged the old technology.

Two of the more influential countries in the world, China and U.S.A. both are taking serious actions on it. In one hand, China just announced last September that it will launch a national carbon market by 2017, and will cap emissions from six industrial sectors. In the other hand, from 2005-2015

U.S. Coal plants have been totally defeated, retired or announced to be retired. Also in U.S. the new electric generation capacity shows a 38.2% of Wind energy, 32.8% of Solar energy, 2.3% of Hydro, biomass or geothermal energy, 26.7% of Fossil natural gas. 0.01% of Coal and 0.07% oil. So, answering to our second question: *Can we change?* The answer is: Yes. Clearly we are in a revolution. This drive us to our third and last question: *Will we change?*

Who pays for clean energy & low carbon applied technologies?

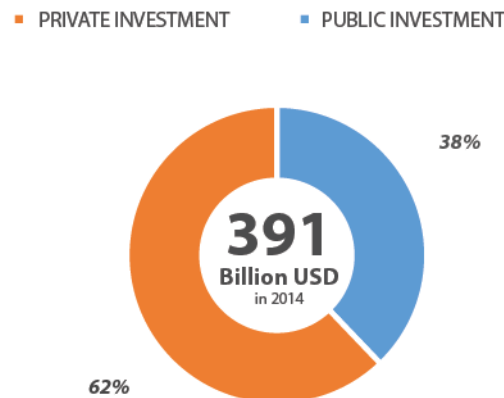


Figure 2: Private vs. public green investments.

1.2.3. The final no⁷

Ok, we are in a revolution, we are changing, but how long will it take? Will it be on time? It is a moral challenge, a new change of paradigm about what is right and what is wrong. In the past we have seen several examples of movements in society that had required to suppurate a moral challenge, such is the case of the right to vote for woman enabled in 1928 in England, or more recently the same-sex marriage enabled in countries such as U.S.A. or Spain in 2016. In the case of Global Warming, the will of acting is in it self a renewable resource. We have everything we need to achieve it in this generation.

1.3. Social business.⁸

We can create business as a solution center, instead as a money center or self center. We can create business so solve social problems. Young generations like it because they don't want to do the old way, they want to do their own way, they want to do things for the world, let's use that power. Young generations are the most powerful generation in history because of the technological access (a 7 years old is much more powerful than a 60 years old man). This idea is conceived by Professor Muhammad Yunus, in Bangladesh. In his books he defines a social business as a business created and designed to solve a social problem (as bigger the problem, simpler the solution). It is a financially self-sustainable business and profits realized by the business are reinvested in the business itself (or used to start other social businesses), with the aim of increasing social impact, for example expanding the company's reach, improving the products or services or in other ways subsidizing the social mission.

⁷ "After the final no, there comes a yes, and on that yes the future world depends." Wallace Stevens (1806).

⁸ "A charity dollar has only one life; a social business dollar can be invested over and over again". Muhammad Yunus (2006).

To build new Social Business Models in our developing communities means to take the path of abundance for all, not only for some. For this thesis, the Social Business represents a strong ideology useful to apply within our knowledge resources about other areas such as botany, biology, landscape, architecture, etc.

1.3.1. Solve problems in business ways.

Philosophically, social business is based on what Yunus identifies as the two basic motives of human beings, selfishness and selflessness. Selfishly, people do seek profit through business; however, social business is also based on the latter motive people by performing philanthropic services, like establishing churches, mosques, synagogues, art museums, public parks, health clinics or community centers. The profits made through a social business's

operations are less important than the beneficial effects it has on society. The seven principles of social business are:

1. Business objective is to overcome poverty, or one or more problems (such as education, health, technology access and environment) which threaten people and society; not profit maximization.
2. Financial and economic sustainability.
3. Investors get back their investment amount only. No dividend is given beyond investment money.
4. When investment amount is paid back, company profit stays with the company for expansion and improvement.
5. Gender sensitive and environmentally conscious.
6. Workforce gets market wage with better working conditions.
7. Done with joy.



Figure 3: Social business direction.

The first existing example of Social Business is the *Grameen Bank*, a Nobel Peace Prize-winning micro-finance organization and community development bank founded in Bangladesh. The *Grameen Bank* originated in 1976, in the work of Professor Muhammad Yunus at University of

Chittagong, who launched a research project to study how to design a credit delivery system to provide banking services to the rural poor. Based on his results, in October 1983 the *Grameen Bank* was authorized by national legislation as an independent bank. The *Grameen Bank* is a social business because it solves problems in a business way. It is recorded that in 2011 borrowers of the bank were 8.4 million, and 97% of those are women. This is because male usually invest money in a more selfish way, while female invest money in a common benefice of families. The bank, beginning from a very modest background, has now distributed 11.35 billion USD in loans, out of which 10.11 billion USD has been repaid.

Nowadays, new green technologies are closely interrelated to Social Business Models. They have already proved to be essentially helpful for developing countries such as Bangladesh or Nepal when installing solar panels in areas where land-cable lines are not available. Surprisingly, the developing countries need no more the old technology since Social Business Models help to finance green and abundant energy in better prices and better payment exercises.

1.3.2. The one-dollar investment growth.

The decrement of cost to access to new green technology allows us to think global while acting local. However, financially speaking we still in a moment of transition between the old way of thinking and the new way of thinking about what we believe on environmental issues investment. Here some studies about it:

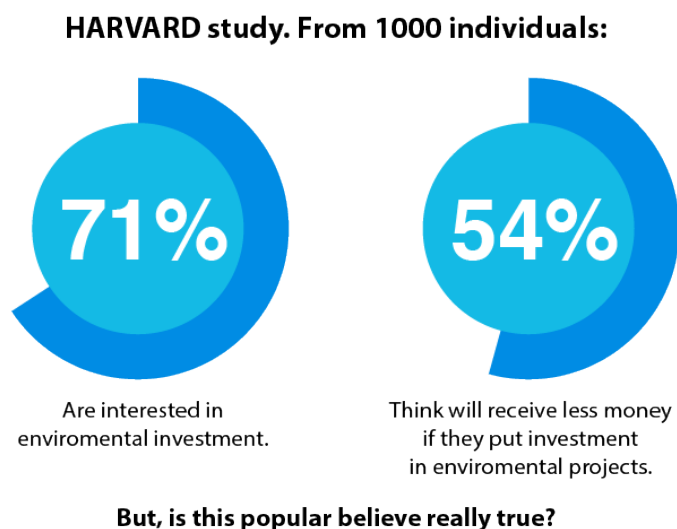


Figure 4: Paradigm about green investment (Harvard study,2013).

A second Harvard study shows the following: if you invested one dollar in 1994 in an investment company whose goal is the maximization of profit, by 2014 you would have received 14.46 USD back, not bad; until you consider the same dollar invested in a company focusing growing their business in environmental issues. By 2014 the same dollar has grown 28.6 USD, almost double. Is important to clarify that this double growth of the dollar is not directly the profit it self, but the care of the operative system of the company wasting less energy, high class culture, loyalty, attention, productivity, lower cost capital, and ultimately better performance in stock price.

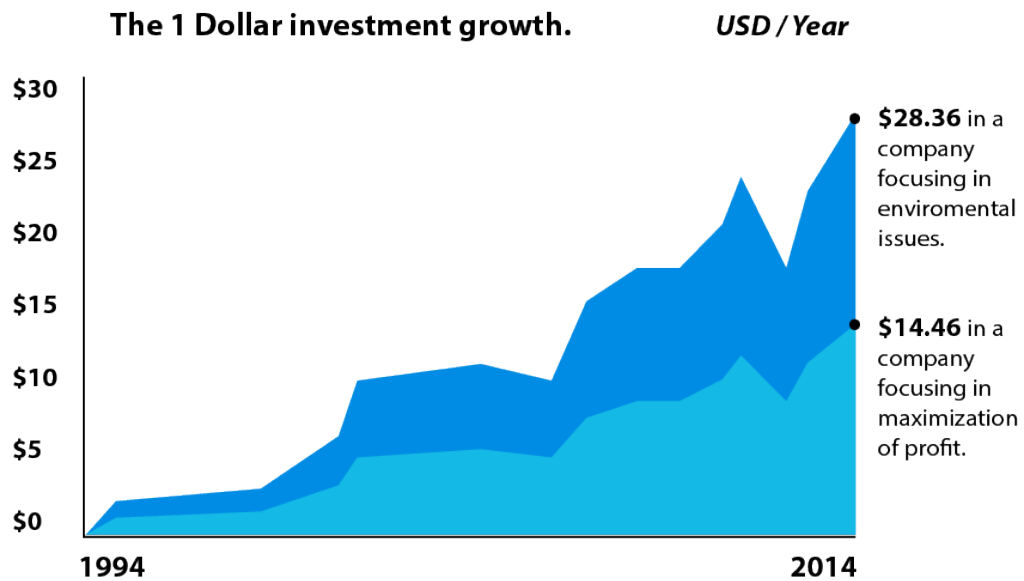


Figure 5: The one-dollar investment growth (Harvard study, 2013).

Environmental investment might be the biggest new business of history. We can identify a sustainable investment in green products/services when:

- This product/service can be used again and again.
- This product/service can inspire someone else to use it too.
- This product/service helps save the planet.

In resume, green clean energy is not only for the elite, or billionaires. We all have the power to do sustainable investing. Each dollar is a message. The one and only obstacle is in our minds. Try and you will see. For that, we need passion and clarity. Passion about the change we want to see in the world, and clarity about our ability to change the course. Invest in the change you want to see in the world. Change your perspective, change the markets. But, why is it that markets are so important, if this is a landscape architecture thesis, not economics? Well, I was expecting this question. My answer is this: Market is an international language. From market we have been affecting the environment until the consequences we are facing right now. Market economy and environmental landscape architecture are hand by hand. In addition, I would like to mention a lesson that my Spanish professor of architecture always insists about. He uses to say: “every time I have to design architecture, I never look to other architecture, I do look movies, books, science, philosophy, economy, politics, music, and everything that has nothing to do with architecture in order to feed with raw information our design decisions”. Please have patience, we will see how the physical landscape is involved in next chapters, but this market economy point of view is equally important and worthy to consider.

In this thesis we will apply our understandings of landscape design in order to formulate a Social Business Model in collaboration with other fields and people to contribute in the eradication of poverty and adaptation to the global warming. Looking more in detail, we will explain two specific local cases, one in Angostura, Mexico and the other in Xinhua, China, in order to understand a global situation and what in common could have two regions separated by 13,000 km and a different culture, but yet humans.

2. The case of Sinaloa, Mexico.

If green business is the new big business opportunity, we can say that bamboo cultivation, processing and utilization contribute to this vision. Bamboo system is aligned to the wealth of world's population and environment. We are on track. Financially rentable, ecologically safe; a transcendental social improvement.

The world is full of “problems”, which in this thesis we will call “opportunities”. “Thinking global, acting local” is a suitable mind-set in the face of difficulties. Thinking global aims to be connected to a world-wide-network of information and people. Acting local aims to download all that available information and put them into practice over specific conditions and specific contexts. The lived experience is fundamental for further feedback. First, let's take a look to Sinaloa, Mexico, and his principal recent challenge: the food supply security under the pressure of climate change.

2.1. Sinaloa's scenery

Sinaloa, Mexico, is the principal food producer of Latin America, with a total fertile valley of 58,328 km², providing food to Mexico, South of USA and Central America. This region located on Northwest Mexico is place of one of the most advanced agricultural technologies and irrigation systems in the World, receiving strong investment from foreign and national companies. In resume, Sinaloa It is a World Class food producer region.

The principal crops of Sinaloa are: cucumber, tomato, pumpkin, eggplant, chili, melon, watermelon, corn, bean, soy, rice, wheat, potato and sorghum. This crop production achieves export quality specially to U.S.A. but also to Canada, Asia and Europe.

However, because the global warming and climate change, since 2009 an unexpected cold wind is arriving to Sinaloa for periods of 3-5 days, killing the 25% of the total production of the year. This damage represents 170,000 hectares of dead crops, and an economical damage of 500,000,000 USD / year.

Even though government authorities and producers together are trying to solve this problem with new policies to support the producers' income while letting the stock market price available for population consumers, since 2010 till now it has proven not to be enough to supply the necessary food in an affordable price. New solutions in food production and food supply are urgently needed. The landscape is about to change.

2.1.1. Mexico historic high-lights.

In Mexico, the first evidence of homo-sapiens activity is tracked back to 11,000 BC. But it was until 5,000 BC that farming emerged here. More or less contemporary to other regions in the world such as China.

By then, the territory had complex indigenous civilization before being conquered by Spain in the 16th century. These indigenous civilizations developed the writing hundreds of years before the arrival of the Spaniards.

From 1521 to 1810, Spain domain the land then called New Spain, establishing their principal city on the ruins of the Aztec capital. During this colonial era, both cultures mixed culturally. Spain legacy is the Spanish language, Catholic and largely western culture.

From 1810 to 1821, New Spain's generation of mixed cultures, became the sovereign nation of Mexico, an independent country. A brief period of monarchy (1821-23) was followed by the founding of the Republic of Mexico in 1824.

By 1846 the Mexican-American war ended two year later with Mexico ceding almost half of its territory to the United States. By 1857, the Mexican civil war was caused by liberal reforms to the constitution. In 1861, the conservatives defeated by liberals, invited France to intervene in the war with the argument to collect on defaulted loans to the liberal government. That's how France restored

monarchy in Mexico. For the next six years, liberals fought the Mexican monarchy until the president of the United States, Abraham Lincoln, supported the liberals cause and executed the emperor, restoring the presidency of Mexico to Benito Juarez in 1867.

From 1867-76 Mexico was ruled by two presidents until the army hero, Porfirio Diaz held power as president of Mexico continuously until 1911. He promoted the modernization of the economy and the flow of foreign investment. Dramatic improvements in public safety, public health, railways, mining, industry and national finances. But it was an autocratic and central government which eventually enter into a violent revolution from 1910 to 1920. During the revolution a tenth of the nation’s population was killed by war and many Mexicans migrated to United States to escape the fight. The revolution ended the system of large landed estates that had originated with the Spanish conquest. Also guaranteed the labor union rights, and the state strengthened its anticlerical measures to control the power of Roman Catholic Church.

Mexico’s timeline

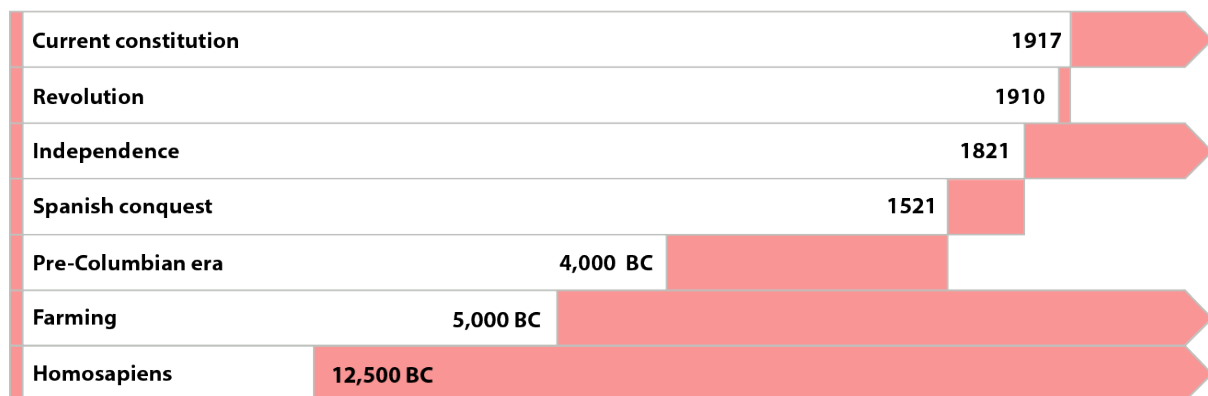


Figure 6: Mexico's historic timeline.

From 1920 to 1929 its marked by political peace whereby conflicts were not solved by violence. By 1929 the PRI (Institutional Revolutionary Party) begun to rule the country for the next 70 years. Following the second world war, Mexico emerged with wealth and political stability and unleashed a major period of economic growth. Many state-owned industrial enterprises were created. The population grew rapidly and became more urbanized while many others moved to the United States. Since 1994 Mexico first commercial partner is United States with the 80% of import and exports. The agricultural industry has been developing the highest technology to optimize production to supply to South of United States (before part of Mexico territory), Mexico and Central America. The second commercial partner is China, with a 4% of participation.

In 2000, PRI was out of power by opposition, PAN (National Action Party). However, specially because the unleashed war on mafias managed by PAN, PRI came back to power.

In resume, since the establishment of homo sapiens in Mexico, the agrarian sector has played a fundamental role. The management of soil will always define the geopolitical situation of a country.

2.1.2. The importance of agriculture in Sinaloa.

Mexico is one of the cradles of human agriculture, and Sinaloa is the most prominent state in Mexico in terms of food production. Sinaloa is known as the “Mexico’s breadbasket”.

During the pre-Columbian era in Mexico, plants such as maize, beans, chili peppers, tomatoes, squash avocados, cacao and various kinds of species were well domesticated. Later, the Spanish

introduced more plants. Farming, from the colonial period until the Mexican Revolution was focused on large private properties. After the Mexican Revolution these were broken up and the land redistributed. Since the latter 20th century, the free market trade (NAFTA) between Mexico and U.S.A and Canada together with economic policies have favored large scale commercial agricultural holdings. More than 60% of Sinaloa's agricultural exports go to the United States. The agriculture sector of Sinaloa employs 23% of the economically active population.

Irrigated agriculture contributes with about 50% of total value of agricultural production and accounts for about 70% of agriculture exports. Mexico has a total land area of 2.2 million square kilometers, from which 23% is equipped for irrigated agriculture. Only Sinaloa represents the 15% of irrigated agriculture. In 1993, the World Bank approved a 303 million USD to support this integrated irrigation modernization project.

The vocation of Sinaloa clearly is agrarian. Each year, Sinaloa cultivates around 925,000 hectares. Almost the 60% is maize. The production of the principal 10 crops represents over 2 billion USD / year. This means an economic density of 1400 USD per hectare.

In Sinaloa, the agricultural activity represents the 13.1% of the GDP, however, in the whole country of Mexico the agricultural activity represents only the 4%. Food supply is a first necessity for population, and Sinaloa is in charge of it in a major part.

2.1.3. Climate change impact in Sinaloa.

Since 2010, each year Sinaloa is struggled by the frosts (frozen winds for 2-3 days in the month of February). Since then, Sinaloa has lost the production of the principal crop, the maize. With this problematic, the federal government of Mexico is supporting Sinaloa providing maize to re-cultivate 300,000 hectares, and so, compensate with 3 million tons of crops. However, the support of government still not enough. This help let Sinaloa still losing 40% rather than 60%. Still too much of losses.

Parallel to the frosts issue, Sinaloa, and Mexico in general, is experiencing an accelerated desertification process. Deforestation has contributed to serious soil erosion nationwide. In 1985, the government classified almost 17% of all land as totally eroded, 31% in an accelerated state of erosion, and 38% showing signs of incipient erosion. Soil destruction is particularly pronouncing in the north and northwest, (yes, Sinaloa) with more than 60% of land considered in a total or accelerated state of erosion. As a result, desertification is spreading throughout the region. The agricultural practice of mono-crop cultivation is not helping. As we know, when we cultivate and harvest only one crop (maize for example) in extensive land, then we need to prepare the soil again and again, and in the long run, the soil will be degraded until achieve desertification. So, as we can see, there are three principal things to adapt or change if we aspire to ensure the food supply: first, adaptation to the frosts with new crops able to resist 0°C for periods of 2-3 days. Second, stop deforesting, or even better, find an alternative way to supply the wood demand. And third, create large gardens of combined species rather than huge mono-crops land.

2.2. Observations about Sinaloa.

Is the erosion process reversible? If so, how can we contribute to reverse this inconvenient environmental processes? And, how happens that the frosts and the desertification get related? This is a major challenge for this generation. The actions we take today will affect our grandsons. The answer must be in our current natural resources in combination with financial strategies to develop a healthy ecosystem that will bring out the landscape architecture we all deserve. This thesis aims no less than the wealth of everyone, not only some, not even the majority, but everyone. If it sounds ambitious for you, maybe you need to expand your reasons about why you wake up every morning. Poverty is not normal.

There is a famous Colombian bamboo architect, who still alive, and his name is Simon Velez. Once I listened to him saying “forest without humans is not forest; forest needs from our harvesting in order to balance the organism and help him grow.”

Of course, fellows, everything in excess is wrong. Let’s take a look of what forestry resources are available in Mexico, then, how can we be useful as human beings to them.

2.2.1. Bamboo and forestry of Mexico.

The 145,300,000 hectares of vegetable covering in Mexico are home of 25,000-30,000 vegetable species from which 1113 species are trees (the wood demand in Mexico is 8,000,000 cubic meters per year). From these 145 million hectares of vegetable covering, 7.6 million hectares are protected natural areas; 6.9 million hectares are introduced vegetation. Mexico has a vast diversity of ecosystems. We find forests of coniferous (16,000,000 has), forests of Encino (15,300,00 has), forest mountain (1,700,000 has), Jungle (32,100,000 has), hydric vegetation (4,700,000 has), heaths (55,900,000 has), grasses (12,300,000 has). Is important to consider that every year there is a lost of vegetable covering of around 200,000 hectares, mainly caused by deforestation and fire. In order to recover those 200,000 lost hectares per year, bamboo plantations postulates as a powerful ally since it is the fastest vegetable to grow. If well managed, bamboo can be dramatically productive. Some bamboo species grow one meter per day in spring. But how to implement bamboo in large scale in order to revert the deforestation and fire issues in Mexico?

In Mexico, the 33% of all the bamboo are endemic species; 39% is native and the rest 28% is introduced bamboo. From the 10,000 hectares of organized plantations 5,000 has are introduced and other 5,000 are native species. The state of Chiapas has 800 hectares of specially *Guadua Angustifolia* bamboo. Veracruz state has 2000 hectares, specially of *Oldamii*, *Phyllostachys Bambusoides*, also *Guadua Angustifolia* and *Oatea*. Puebla state has an other 1,200 hectares of *Guadua Aculata* bamboo.

2.2.2. Bamboo potential for Sinaloa.

From the 31 states of Mexico, only 12 have the proper conditions to host bamboo species. This 12 states in total accumulate 2,850,000 hectares of potential for Bamboo. This represents the 2.1% of total vegetable covering of Mexico. Only Sinaloa has 250,000 hectares (9%) of potential to establish productive bamboo forests among its 11 rivers of the state and the fertile valley. Even though other states such Veracruz (500,000 hectares of potential) or Chiapas (300,000 hectares of potential) they don't have the top technology for agriculture development nor the commercial logistics specially to U.S.A. and Canada (the principal importers of bamboo products of the world). Sinaloa accumulates the right conditions and the main problems to solve in order to establish bamboo plantations as an ecological response to the climate change and economical development ensuring the food supply for U.S.A and Mexico. In addition, as we all know, bamboo has more than 1000 uses, all those uses are an extra income to explore. So far, is enough job to stimulate the shoots industry for ecological and economical benefits.

In China, even though is the more advanced bamboo industry of the world, facts show that this bamboo industry is just beginning, and we can say that still in a young stage of development. Still a lot to do and market will grow each time more and more thanks to the green business required all over the world. Sinaloa can compete directly with China in bamboo products exporting to U.S.A, the principal importer of Bamboo products of the world. Sinaloa has some advantages and disadvantages in this healthy competition. Advantage is that Mexico and U.S.A. share border, that means a very close distance between the place of origin and the place of shipment. Another advantage, in the case of bamboo shoots, the shoots will arrive fresh to U.S.A. instead of the can products sent from China because of the 13,000 kilometers of distance between both countries. A disadvantage of Sinaloa in the bamboo industry is obviously the sub development of bamboo industry comparing with China.

In order to begin with the bamboo plantations for Sinaloa and explode the possible 250,000 hectares, is important to begin with a pilot project. A small plantation project. Why? First we need to begin with something we can handle, something we can make mistakes to learn. A 50 hectares' project will be enough to begin. First we reach quality, then quantity. As a matter of fact, these are 10 things about bamboo, about why we want it inside our ecosystems:

1. Fastest growing plant in the planet.
2. Absorb more carbon than any plant.
3. Prevent soil erosion with its root system.
4. More durable than wood.
5. Creates structures.
6. In the developed world is cool, in the developing world is key factor.
7. Is profitable.
8. Infinite uses.
9. Manufacture and plantation can eradicate poverty in developing countries.
10. Offer sustainable solution for the whole world.

The elected region to develop the first small project to achieve quality, is located in a place called Angostura, in Sinaloa. The principal aspect of this place to select is the willing of their people to do it, as they recognize the need of new alternatives to fight the struggle of the frost and desertification. For them, it is a case of life or death. The labor cost conditions in Angostura today in order to begin this plantation, look like this: 1 worker: 13.5 USD per day. Including activities such as: irrigation work, laborer, cleaning and planting. Tractor man: 18.5 USD per day plus medical insurance 105 USD per month, bonus 225 USD per year, and utilities: 187 USD per year. In total, the labor cost per person/year is 5860 USD.

In Angostura, Sinaloa, the weather conditions today look like this: Altitude: 24 mosl. Temperature 41°C Maximum, 2°C Minimum, and 24°C average. The raining seasons are from June to September and from September to October. However, 8 months per year water is available from dams and wells. These 8 months can become 12 months a year if we do some adjustments. That's an other chapter.

2.2.3. Adaptable productive bamboo species for Sinaloa.

So, according to our data, from all the vegetable covering in Mexico (145 million hectares), 6.9 million hectares are introduced vegetation. In addition, the 28% of all the bamboo species living in Mexico are introduced bamboo species. In that sense, to introduce a new specie won't be new deal. Actually, if we impact our ecosystem anyway, then we better do it in a positive way. A negative way would be to keep logging excessively, it stimulates desertification and droughts. But a positive way would be to plant extensive bamboo forest in order to increase our biomass with an evergreen system, affecting the environmental temperature dramatically. In theory, with well managed bamboo forests, there is no need to log more trees for wood, since bamboo can provide it in a fastest and more economical way. One of the current objections we hear in Mexico about bamboo plantations is: "bamboo plantations only bring rats and snakes to our homes". That is not a right way to think. I mean, of course if we don't manage properly a bamboo plantation sooner or later it will be full of other vegetation and will provide the ideal conditions to host different animal species. Actually, it would happen with any other crop (maize, beans or whatever). Bamboo needs care, just as any other productive crop.

Ok, here is a key question: from the more than 5,000 bamboo species known by human, which one of them will be able to resist and evolve successfully into the Sinaloa environment for ecological

improvements and economical benefit? (including the recent frost that are killing other crops) Well, we have three candidates: *Dendrocalamus Asper*, *Dendrocalamus Brandisii*, and *Dendrocalamus Latiflorus*. Let's take a look into these three species, and choose the accurate one.

Dendrocalamus Asper. It is a 20-30 meters high and 8-20 cm diameter bamboo. Is one of the economic important bamboo species. It is distributed in Southeast Asia, and widely introduced to tropical and subtropical regions. Its main usages are as a material for building and pulping. Its shoots are delicious as vegetable. In normal conditions it can survive in Sinaloa. However, it can not resist the recent frosts in Sinaloa.

Dendrocalamus Brandisii. It is a 30 meters high and 15-20 centimeters diameter bamboo. Is also one of the economic important bamboo species. It is distributed in Southeast Asia, and introduced to south China. Its main usages are as a material for building, making daily life tools, and shoots are delicious as vegetable. In normal conditions it can survive in Sinaloa. However, it can not resist the recent frosts in Sinaloa.

Dendrocalamus Latiflorus. It is a 14-25 meters high and 8-20 centimeters diameter bamboo. It is one of the economic important bamboo species. It is distributed mainly in South China and has been introduced to Southeast Asia. Its main usage is as a material for building and making daily life tools and pulping. It is one of the main shoot production species in China. This is the only *Dendrocalamus* species that can resist the frosts. This specie represents the opportunity for food supply in Mexico and U.S.A. There are 170,000 hectares of opportunity only in Sinaloa. It will be imported-exported from Costa Rica (Central America) to Sinaloa Mexico. This is an introduction of a new specie for Sinaloa's ecosystem.

Bamboo as food? Is it a reality? In China, bamboo is well known as a delicious vegetable and its cook in many different ways. In Mexico is not normal yet, but in USA has a largest demand of shoot in the world. Because of the strong commercial relationship between Mexico and USA, we can supply bamboo shoot first to USA as there is a large population of Chinese. This is a nutrition comparison between Moso bamboo and other crops.

Comparison of Nutrient Contents of Several Vegetables (edible parts per 100 grams)

Vegetable	Protein (g)	Fat (g)	Carbo (g)	Calcium (g)	Phosphor (g)	Ferro (g)
Moso Bamboo Shoot	2.6	0.2	7	10	76	0.5
Radish	0.6	0	6	49	34	0.5
Cabbage	1.3	0.3	4	62	28	0.7
Lotus Root	1.0	0.1	20	19	51	0.5
Lettuce	0.6	0.1	2	7	31	2.0

Figure 7: Bamboo shoot comparison of nutrients with other crops.

2.3. Actions to take in Sinaloa.

Now that we know the global scenery (in very, very general terms) and we recognize the natural resources we have, is time to take action. These natural resources that we have are the same resources

that we can lose or multiply. There is no mid point. Or like Yoda used to say: “do or do not, there is no try”.

2.3.1. Establishment of bamboo plantations in Sinaloa.

From the 250,000 hectares of potential for bamboo plantation establishment in Sinaloa, we will pick the first 50 hectares in a region called Angostura, inside Sinaloa state, Mexico, as a pilot project to achieve first quality, and then quantity.

Because of the weather and soil conditions, in Sinaloa the proper bamboo specie to develop plantations is from the Sympodial side. The best book available and the only one we will probably ever need is “Bamboo and Rattan in the World” from which we resume the following process to establish bamboo plantations. In addition, we will adapt this redaction for the Sinaloa conditions and market. This is something that we have been waiting for 7 years. Three things: *site, seasons and methods*.

Site. Sympodial bamboo demands warm and moist climate for its growth. Although a few species can endure a moderately low temperature, most species cannot survive when it falls below zero. Therefore, temperature is the major factor affecting sympodial bamboo growth. Temperature and precipitation are primary concerns when selecting a plantation site beyond the region of origin. Sympodial bamboo has no underground rhizome, and new seedling grow from buds on both sides of the mother culm base to form clumps. Moist land on riverbanks or along creeks are the ideal sites for commercial sympodial bamboo plantations. Dry, gravelly, clayey, poorly-drained or alkali soil plus mountain ridges and poorly irrigated lands are not suitable for this purpose.

Season. The best time for sympodial bamboo silviculture is spring before germination of buds and flowing of sap. However, transplanting of seedlings or mother bamboo within short distance can be done throughout the year irrespective of the season, as long as intensive care is taken following planting. The key to succeed is a balanced water supply, the optimal time is before rainy season starts in areas with distinctive dry and wet seasons. In Sinaloa, because the high quality irrigation system, we can transplant mother bamboos and seedling anytime.

Method 1: Mother bamboo transplanting. As a traditional method, mother bamboo transplantation ensures higher success rates and faster stand establishment (3-5 years), and produces more and bigger shoots. The selected mother bamboo should be a healthy, pest and disease free plant of 1-2 years old with medium diameter and fat node buds at the culm base. Follow this procedure:

1. Dig out the soil around the root ball from a distance of 25-30 cm to near the roots.
2. Find out the connection part linking the mother bamboo rhizome and the old bamboo, which is cut off a sharp chisel of a knife. Then, the mother plant is dug out with root ball and soil associated. Small diameter species have closely connected root systems, so they have to be dug out in clumps of 3-5 plants.
3. The upper part of the culm is cut off at the middle of an internode, with only 5-8 nodes and 2-3 rounds of branches left. Dense planting is suitable for shoot-producing stands, while large-diameter species can be planted in a lower density. On level lands and gentle slopes, the density is around 500 pieces per hectare.
4. The hole for planting should be one or two times larger than the root ball, usually 60 cm in diameter and 30-40 cm deep. Back fill the hole with some fine soil before placing the plant into the hole at an angle, which is covered with top soil to be firmed down and washed. Then cover the surface with subsoil in dome shape to be mulched with weed.

Method 2: Bamboo seedlings transplantation. To establish large scale plantations, nurseries have to be set up to raise seedlings. This method guarantees high success rates and low cost. Due to easy transportation, it is also suitable for long distance introduction. Seedlings with a diameter of more than 0.5 cm at culm base can be transplanted to plantations.

1. Dig them in clumps, trim off most of the branches and leaves and keep several nodes near the base.
2. After being separated into small clumps of only 2-3 seedlings, they are transported to the stand site with their root balls bound up in dysentery soil. Planting density is the same as in transplanting mother bamboo.
3. Seedlings are planted in the hole with root system unfolded, and covered with soil to be firmed down.
4. After watering, another layer of loose soil thicker than the sedentary soil is added, which is mulched with weeds to maintain moisture.

Method 3: Bamboo node layering or branch cutting. Sympodial bamboo stands can be established directly by internode planting or branch cutting on sites with favorable conditions.

1. Plant 3-4 pieces in each hole.
2. Water well and mulch with weeds to protect them from strong sunlight. Routine management such as watering and shading is needed following planting.

As we can see, these methods are not “rocket science”. These methods are quite simple. However, one thing is the establishment, and another thing is management. Coming up next is the synthesis for management.

2.3.2. Management of bamboo plantations in Sinaloa.

Dendrocalamus Latiflorious and other rich species of sympodial bamboo are widely distributed in tropical regions and the south of subtropical regions, most of which occur in mixed natural forests managed in a rather extensive manner. Currently, yield increase is achieved mainly through soil and manure management, structure adaptation and bamboo shoots harvest. Soil and manure management of sympodial bamboo stands requires special technical measures such as basking shoots, manure application, earthing up, irrigation and clean tillage. Let's take a look into each one of these concepts.

Basking after digging up. In this measure, soil surrounding the plants' root balls is dug out in each spring to expose the rhizome and shoot tips so that all the shoot eyes can enjoy direct sunlight. The purpose is to hasten shooting in larger numbers. When digging soil, circle in with great care, and at the same time remove the mess of the root system and cut off fibrous roots entangled on shoot buds.

Manure application. The general experience is that manure is applied at three stages each year in sympodial bamboo stands. The first manure is needed after basking in order to stimulate shoot sprouting. Fasces or well rotted compost is applied around bamboo clumps and then covered with soil. The application rate is 15kg for refuse manure, and this should be adjusted to specific site conditions. The second stage of manure application is in mid to late May to reestablish nutrition that has been used during differentiation and swelling of shoot buds. A quick-acting fertilizer is often used in this stage. For shoot-producing stands, the third manure is done after shoots harvests by applying diluted urea solution to rhizomes.

Caverning shoots. After exposure to sunlight, some shoot eyes begin swelling and develop shoots. Move back the soil at this time to cover shoot buds so that they can grow in dark conditions to pleasant-tasting, delicate and fat mature shoots.

Irrigation. Channeling water for irrigation is highly recommended for shoot-producing stands. A pump can be installed or a water reservoir built if there are rivers, wells or ponds nearby to ensure irrigation once every or every second week in dry season, which hastens shoot sprouting and increases yield.

Tillage. Lean tillage is usually done in slack farming seasons or during basking, earthing and shoot harvesting. In some regions, it is carried out during logging of old bamboo, when root balls are also dug out and the whole site is ploughed to 20cm deep in order to improve weathering and aeration of the soil.

Structure adaptation, initial planting density. According to the research report of Taiwan Forestry Research Institute in 1984 on economic analysis of *Dendrocalamus Latiflorus* production, the density of slope and level land was 204-400 clumps per hectare (Ren Yian 1984). However, in some regions with a long history of bamboo cultivation, a much higher density is widely adopted. Experiments on shoot-producing stands carried out in Jinchuan in Zhejiang province showed that a density of 825 clumps per hectare produced the largest number and quantity of shoots.

Plants number per clump. In theory, maintaining a number of mother bamboos of shooting age as large as possible is necessary to increase the yield of either shoot or culm producing stands. The recommended number of plants per clump is 12-14. However, a much smaller number of younger mother bamboos is preferred for shoot-producing stands in some regions, where each clump has only 5-7 or even 2-3 mother plants.

Bamboo age structure. With their well-growing oculus on root balls that are highly capable of sprouting, young and middle age plants of 1-2 years old are the bases for regeneration of sympodial bamboo plantations. The 3-4-year-old bamboos are mature, of which many oculus on root balls have already produced shoots and new seedlings. Although the remaining shoot eyes are less capable of sprouting shoots, their exuberantly growing branches and leaves can support and protect the younger plants from wind. Therefore, the 4-year-old bamboo is logged selectively each year to maintain a balanced age structure or organism.

Shoot harvest and bamboo reservation. Degraded shoots are inevitable during shooting of sympodial bamboo, as also happens with monopodial bamboo. The percentage is reported to be as high as 71% in certain cases. Therefore, much attention should be paid to cutting shoots and reserving bamboo in either shoot or culm producing plantations. A special technique is required for collecting sympodial bamboo shoots. Some tillers at the base of shoots that have been harvested are still capable of sprouting new shoots, so the method for collecting monopodial bamboo shoots can not be applied. Instead, shoots at earlier and later stages of emergence are usually harvested. When they emerge to the ground level, dig out the soil surrounding the shoot buds to expose the shoots and the cut them off with knives.

2.3.3. Complementary systems (AOWE) for Sinaloa landscape.

For cities, what is more important: water or electricity? Regularly, people answer “water” since it is the vital liquid to live. However, for cities and communities, electricity is more important because without electricity water can not be distributed in large areas. Water for food, electricity for water.

(AOWE) American Offshore Wind Energy. Essential element to detonate huge industrial investment, information technologies, tourism and services; all in an ecologic, economic and social high

quality performance. It will create the foundation to promote the confinement of high technology greenhouses with the objective of achieve an economic development globally competitive. It creates thousands of employments and contributes largely in the eradication of poverty and balance of the climate change.

The Offshore Wind Energy is the more efficient system for generation of green electricity existing today. However, the establishment of the Offshore Wind Energy farms is possible only in less of the 1% of our oceans of the planet. Germany (the inventor) and China have built it. The only other place in the planet that collects the rare conditions of bathymetry, meteorology and logistics necessary for the adaptation of this technology is in Sinaloa Mexico. This represents important competitive advantages for the world. It is a huge green business operated through abundant offer of electricity with zero carbon emission for food production, goods and services.

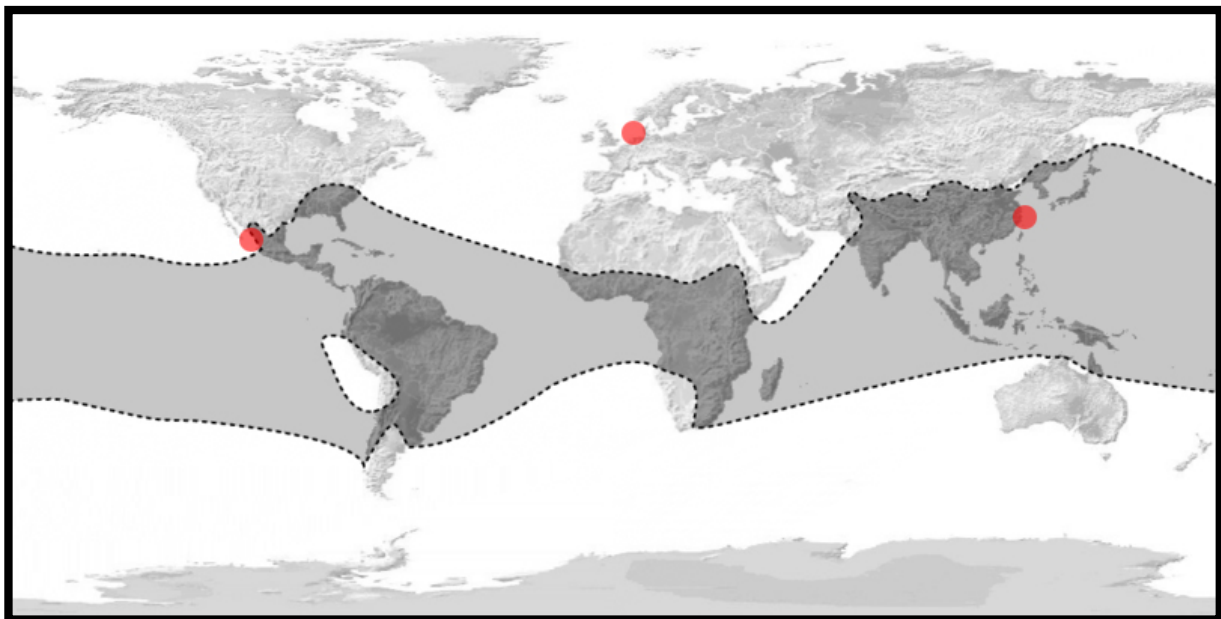


Figure 8: Offshore Wind Energy limited locations.

It detonates massively the investment and employment in a sustainable manner for the continent, based in Mexico.

The objective of AOWE is to elevate the global competence of the world economy from Mexico trough green energy. It rises the agricultural activity in a totally new level, saving 90% of water in new irrigation systems and increments its performance in 5-12 times per hectare. In addition, it contributes in the attraction of industrial, commercial and information technology investments, while reducing dramatically the emission of CO₂. Mexico is one of the most attractive regions to invest produce, live, develop, study, research, vacation and develop technology.

In Mexico, more than 75% of electricity is produced by combustion. In the states around the Gulf of California it is 90%. This is why the electricity production is the principal cause of global warming. In a global context where the global warming is closely related to the CO₂ emissions, every site in the planet able to offer abundant and reliable green electricity, will have a significant advantage world wide.

There is a relationship between the economic development and the energy consumption. More economic development, more demand of energy consumption. But, besides the economic development, the access to huge volumes of water has become in one of the major challenges of Mexico and the world.

The processes to obtain and pump water are highly demanding electricity. For example, the treatment for residual waters requires 2-4 kWh/m³; the transformation of salty water to potable water requires 4-6 kWh/m³ and only the pump of water requires 1-2 kWh/m³.

AOWE allows us to dispose the huge quantities of green energy required by the economic and ecologic development of our societies.

Even though the Onshore Wind Energy (installed in land) is world wide well known, with antecedents recorded 3,000 years BC, the Offshore Wind Energy (installed in ocean) is one of the technological developments more important and beneficiary of the last generation, from which its first antecedent is recorded just in 1991, and its definitive certification was achieved just in 2009.

The main reason to use the wind of the ocean is because the quantity and quality of the wind resource is dramatically superior to the Onshore wind resource. This only technology provides the bases to transform the country and the continent in one of the more attractive sites of America to invest, produce, life, study and vacation.

This Offshore Wind Energy farm has an installed capacity of 300 MW. That volume of electricity attracts the more advanced companies creating more than 30,000 employments. In a second stage, It is possible to expand it to 4,500 MW for national and international consume.

The first Offshore Wind Energy farm in Mexico has a factor capacity of 300 MW, which represents an economic value of 1,600 million US Dollars. Expanding to 4,500 MW will represent an economic value of 25,000 million US Dollars.

The potential of generation of electricity with Offshore Wind Energy in short and medium periods is about 240 GW. This represents the capacity to supply several times the total demand of electricity in all Mexico and south of the United States.

The first Offshore Wind Energy farm was inaugurated in 1991. However, it was until 2009 when finally, all the technical, political, financial and security challenges were dominated in Germany and Denmark. China made great efforts to take advantage of this conditions to build them in Chinese territory in 2011.



Figure 9: Offshore Wind Energy farm.

This represents a radical change in the appearance of our landscape, as we will see in next chapters. Are you asking your self what does AOWE has to is green natural stuff? It is completely aligned with the new energy resources that keep and improve our natural environment in a profitable way. As we mentioned before in the chapter 1.3.3.2. *The one-dollar investment growth*. Every dollar is a message. Bamboo is great ally, but greater would be to have a compilation of green systems in order to create stronger and more coherent super-systems to support our cities of the future.

Sinaloa has eleven rivers and eleven dams. This is one of the main reasons of why Sinaloa is the principal producer of food of Mexico. Water distribution in Sinaloa is always a topic between the producers, and generally they complain about the lack of the vital liquid. No mater how abundant water is, if it is not well distributed we might find droughts where it could be water and gardens.

2.3.4. The Living City Sinaloa.

Frank Lloyd Wright (1867-1959) is recognized by the American Institute of Architects as the greatest Usonian⁹ architect of all time. Wright believed in designing structures, cities and communities that were in harmony with humanity and its environment, a philosophy he called “organic architecture”. Throughout most of his lifetime he developed an urban or suburban concept presented in his book *The Disappearing City* in 1932 and refined in later book *The Living City* in 1958.



Figure 10: Comparison between Frank Lloyd Wright's *Living City* (1958) and Sinaloa agricultural fields (2012).

The *Living City* is the antithesis of a city and the apotheosis of the newly born suburbia. It was both a planning statement and a socio-political scheme by which each family would be given 4,000 m² of land from the federal lands reserves and a conceived community would be built anew from this. In a sense it is the exact opposite of transit-oriented development. There is a train station and a few office and apartment buildings in the *Living City*, but the apartment dwellers are expected to be a small minority. All important transport is done by automobile and the pedestrian can exist safely only within the confines of the 4,000 m² plots where most of the population dwells.

⁹ But why this term “America” has become representative as the name of these United States at home and abroad is past recall. Samuel Butler fitted us with a good name. He called us Usonians, and our station of combined States, Usonia. -Frank Lloyd Wright on *Architecture* (1957).

Anyway, here is a remarkable “coincidence” between The Living City of Frank Lloyd Wright and Sinaloa Mexico.

The picture of the Living City (1958) is a futurist vision about balanced communities in harmony with the environment. Well, we are in 2016, yes, the future. Even though Frank Lloyd Wright passed away in 1959, his ideas still alive in our common sense as human specie.

The picture of Sinaloa Mexico (2012) is a picture took by famous Mexican photographer Maceo Ruiz shoot from an airplane overseeing the agricultural fields in the Expo-Agro Sinaloa 2012, the biggest and most important international agriculture event of Latin America, and one of the more important of the world, organized year by year in the capital of Sinaloa.

We find fascinating the similitude between both pictures. It is pretty much as if Frank Lloyd Wright draw his picture seeing the future in Sinaloa Mexico as an example for the cities of the future. Just look at it. Its amazing.

Frank Lloyd Wright’s Living City marks a clear direction for Sinaloa which can be enriched with complementary elements such as the bamboo system and the offshore Wind Energy. The future is today.

3. The case of Xinhua, China.

Xinhua (新化) is a beautiful region renowned by its natural beauty, rice terraces, fascinating caves, abundant bamboo forests, delicious spicy food and kung fu; situated in central Hunan province, 310 km southwest of the capital of Changsha. A clear example of human and nature harmony.

The fast economic growth in large cities of China and the slow adoption of Deng Xiaoping's reforms in rural Xinhua had caused a rural-urban migration phenomenon with no precedent. The aspirations of modernity for rural migrants depends largely in the rural-tourism development.

3.1. Xinhua's scenery.

China is the biggest agrarian society by population in the world and the challenge of rural socio-economic development has always been the first and foremost issues for Chinese governments. In the particular case of rural Xinhua, the 22,000 hectares of natural Moso bamboo shall be activated to join the 3 billion USD / year industry of bamboo product exports from China to the world. At the same time that running architecture projects collectively to reutilize abandoned traditional buildings into libraries, hotels, schools or restaurants. Xinhua is a potential world class rural tourism international destination which is in process to be nominated as the 49th China's UNESCO World Heritage Site.

3.1.1. Xinhua's historic high-lights.

Evidences show that Homo sapiens inhabited Hunan region dating to 125,000-80,000 BCE. However, it is until 4,000 BCE, in the Neolithic age, that farming emerged here, at the same time than in England and Peru. Contemporary to the raising of Mesopotamia.

During the five Dynasties and ten Kingdoms, the agricultural colonization of the lowlands gradually happened by managing river dikes to protect farmland from floods. By then, Hunan experienced several migrations from the north, specially after Qin conquered the heartland in 278 BCE.

China's timeline

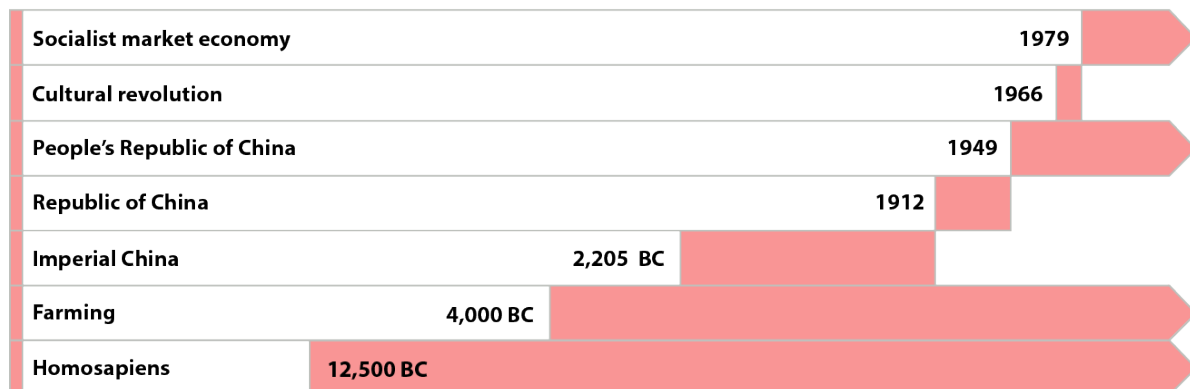


Figure 11: China's history timeline.

After the formal creation of the province in 1723 during the Qing Dynasty, Hunan became an important communications center due to its position on the Yangzi River. Also was an important center of scholarly activity and Confucian thought. Hunan land produced grain so abundantly that it fed many parts of China with its surpluses. In 1805, because the fertility of the land, Hunan became overcrowded and many rebellions emerged caused by ethnic tension.

In 1910 there was uprising against the crumbling Qing dynasty, which was followed by the Communist's "Autumn Harvest Uprising" of 1927, led by Hunanese native Mao Zedong. During Mao's

regime, due to a new independent industrial system and incentives to marry, Chinese population almost doubled from around 550 million to over 900 million. However, Mao’s large-scale economic and social reform project together with drought and poor weather contributed to the Great Famine of 1958 and 1961, resulted in an estimated 45 million deaths mostly from starvation. A lot of controversy due to this event is tattooed in the Chinese collective memory.

As Mao Zedong’s home province, Hunan supported the launched Cultural Revolution of 1966-1976. However, it was slower than most provinces in adopting the reforms implemented by Deng Xiaoping in the years that followed Mao’s death in 1976.

3.1.2. China’s fast economic growth.

Before the Deng’s reform period, Ziquejie in Hunan, and in general China, agricultural and industrial performance was extremely poor and food shortages were common. In the transition from Mao’s regimen in 1976 to the opening up reforms in 1979, Deng Xiaoping, as leader in fact of China and in order to unify the country politically and to succeed in the implementation of deep reforms, addressed Mao as a “great Marxist, proletarian revolutionary, militarist and general”, and the undisputed founder and pioneer of the country and the People’s Liberation Army. Deng’s statement about Mao: “His accomplishments must be considered before his mistakes” and personally commented that Mao was “seven parts good, three parts bad”. In November 1978 the country had stabilized political turmoil

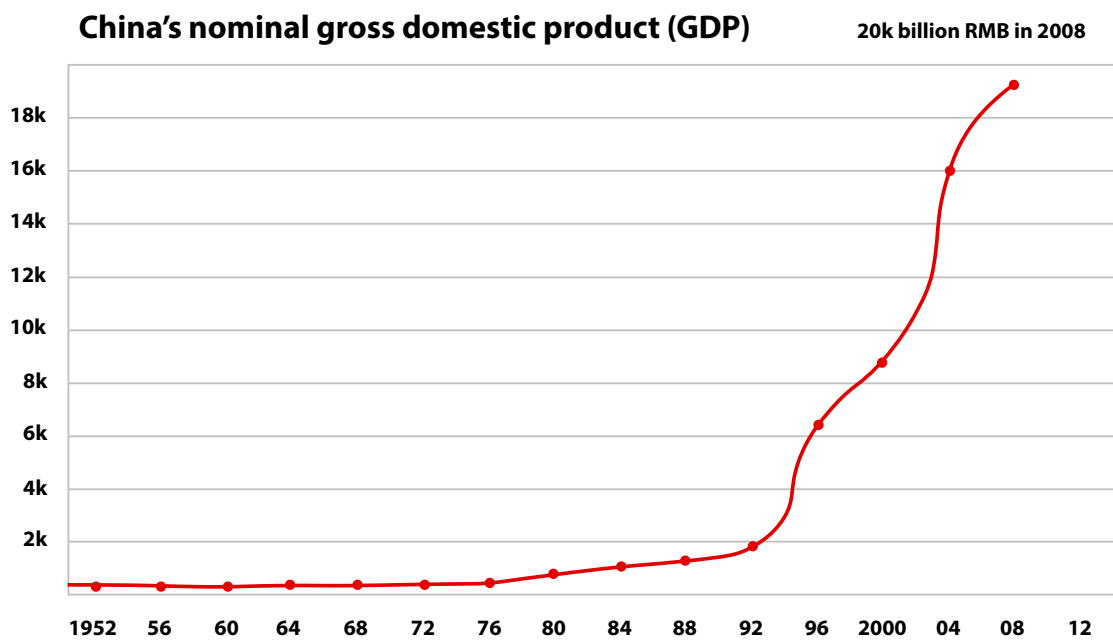


Figure 12: China's nominal gross domestic product (GDP).

The economic reforms by Deng were carried out in two stages and the main goal was to create the Socialist Market Economy which is a system based on the dominance of the state-owned sector and an open-market economy. The ideological rationale is that China, in the first stage, from late 1970s to early 1980s, install a socialist mode of production involving the decollectivizing of agriculture, the opening up of the country foreign investment, and permission for entrepreneurs to start businesses. The second stage of reform in the late 1980s and 1990s, was to adapt capitalist techniques to thrive, involving the privatization and contracting out of much state-owned industry and the lifting of price

controls, protectionist policies and regulations, although state monopolies in banking and petroleum remained.

Private sector grew remarkably and poverty was reduced. However, unplanned corruption and inflation increased discontent contributing to the Tiananmen Square protest in 1989. There was a significant impact on the Chinese economy after the incident. Foreign loans to China were suspended by the World Bank, Asian Development Bank, and foreign governments. Tourism revenue decreased from US\$2.2 billion to US\$1.8 billion. Also foreign direct investment commitments were cancelled. So, Deng's power had been weakened and there was a growing formalists faction opposing to Deng's economic reforms. To reassert his economic agenda, in 1992, Deng made two famous southern tours in China, visiting Guangzhou, Shenzhen, Zhuhai and Shanghai.

In his speeches he generated large local support for his reformist platform, stressing the importance of economic reform in China. Deng's insistence on economic openness aided in the phenomenal growth levels in areas around Shanghai. Since then, the economic performance of China has no precedent. Economists estimate China's GDP growth from 1978 to 2013 at between 7.5% to 10.5% a year.

Deng's theory, however, still facing numerous challenges when put into practice, as provincial governments moved to protect their own interests. He reiterated that "some areas must get rich before others". Such is the case of Ziquejie, Hunan, situated in the edge of the economic growth of China, with its particular local challenges.

3.1.3. Migration phenomenon.

In 1958, Mao's regime established the *universal hukou system* in cities, which restricted the mobility of the population. It aimed to tie farmers to land, secure agricultural supply as well as to support industrial sector in cities after the Great Leap Forward and Great Chinese Famine which caused 45 million deaths. The *hukou system* allocated housing, jobs, food and other necessities. It was almost impossible for people without local *hukou* status to live in urban areas. At the same time, in the rural provinces was established the *people's commune system*, which was another tool to control labor mobility. Under the *people's commune system*, the earnings of farmers were closely related to their daily participation in the collective farming.

In 1978, during Deng's economic reform, the *people's commune system* was replaced by the *household-responsibility system*, by which local managers were held responsible for the profits and losses of an enterprise. The system became instantly successful, quickly causing a large increment in standard of living for such a large number of people in such a short time. However, in its first period from 1979 to 1983, government still prohibited migration. It was in its second period from 1984 to 1988 when farmers were allowed to enter urban areas on the condition that they provided their own food. The third period is from 1989 to 1991 when migration became much more popular and had attracted much attention from the government. The fourth period was from 1992 to 2000, during which the government actually encouraged migration, while urban local governments controlled migration more strictly because of high unemployment rates in cities.

In 2007 humanity crossed the line of more people living in cities than in rural areas worldwide. China has enormously contributed to this global statistic. Since the economic reform in 1979 to 2009, 340 millions of farmers immigrate inside China to seek for new sources of income and/or for the diversification of the agricultural base. It is the largest number in human history. By 2025, the rural-urban migrants would represent the 40% of the total urban population in China.

The factors influencing rural-urban migration are employment, education, business opportunities and higher standard of living. Rural Ziquejie, Hunan, exemplifies this migration phenomenon.

China's annual disposable income

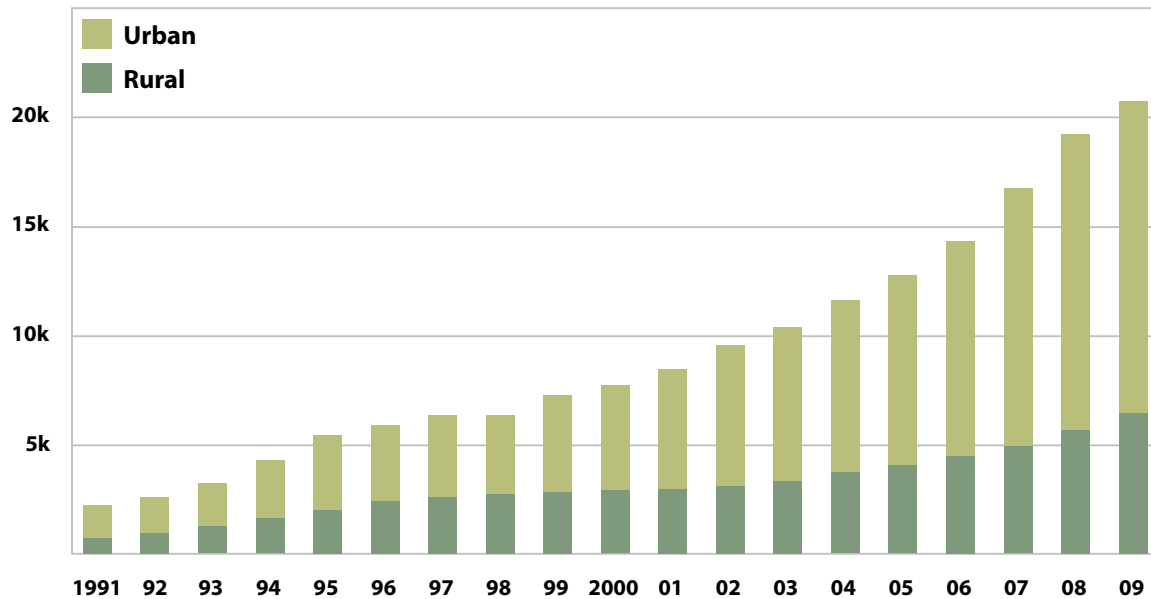


Figure 13: China's annual disposable income.

3.1.4. Rural tourism.

Since the 1949 communist revolution, China has made “city” synonymous of modernity, while “rural” has been synonymous of tradition and continuity with the past, but ideologically identified with two ambivalent layers. The first one is a legendary or romanticized layer signifying an idyllic rural life and natural scenery such as family intimacy, green lifestyles, simplicity, unsophisticatedness, fresh air, open space, virgin forest and so on. The other one is a stigmatized layer associated with poverty, ignorance, insanitation, underdevelopment, or barbarism.

The slow adoption of Deng’s reforms in rural Ziquejie, Hunan, and the fast economic growth in large cities of China had caused a decline in the ability of farm agriculture to generate sufficient income. Family’s fathers from rural Ziquejie contribute to the migration statistics meanwhile wives and children remain rural. Family fragmentation proposes a cultural identity crisis for the further years.

Globally seen, is a tendency that depressed agrarian societies initiate rural tourism as a key role in the development of their rural areas. For instance, since the 19th century in Europe, the rural tourism has been widely encouraged, promoted and relied as a useful mean of tackling the social and economic challenges. In countries such as France, Austria and United Kingdom rural tourism already represents a significant factor and has a growing demand.

China is the biggest agrarian society by population in the world and the challenge of rural socio-economic development has always been the first and foremost issues for Chinese governments. Since the late 80’s China’s government is promoting rural tourism development as a significant driving force for poverty eradication, sustainable development, and environmental protection.

For instance, in 2013, 740 million Chinese tourists traveled inside the country’s frontiers, from which 300 million visited some rural attraction, creating 40 billions RMB in revenue only in rural tourism concept. So far, six inter-related business models have been identified in different rural regions of China, including Ziquejie, Xinhua, Hunan:

1. *House hold-run small business*: The most popular particularly with those whose farm is located within or near scenic areas or cultural sites. The presence of owner and/or house wife is predominant for the business to survive. Traditional and simple management working in meal cooking and bed making.
2. *Individual farmstead*: Led by the exemplary role of an individual farmstead for its success story in a particular product or service, the other farmers are motivated to join in the business of rural tourism and develop the specialization to contribute in the transformation of the business into a designated spot with larger size and scale.
3. *Farmer family plus farmer family*: Two families or more organize and coordinate each other in order to specialize in a rural tourism product or service. The structure of this business model can be adjusted and/or improved according to migratory movements and market demands in the rural community.
4. *Corporation plus farmers*: Investors from outside the villages are invited by the local government for setting up a tourism corporation specializing in the development and management of the village's rural tourism. Corporation leases land and resources from farmers in order to get them involved in developing and managing rural tourism attractions and facilities. The corporation is responsible for providing technical guidance and cultural training.
5. *Corporation plus community plus farmers*: "Community" refers to a rural tourism association representing the local authority. "Corporation" integrates the community leaders in the board of directors. Farmers provide services and products of rural tourism to visitors, with the guarantee of getting salary and other financial benefits from the corporation.
6. *Government plus corporation plus farmers*: large-scale rural tourism attractions. The government at the local or regional levels need to requisite the land from farmers in order to employ them in a corporation which is either organized by government inviting outside investors or organized by the local community authority as a collectively-owned rural enterprise.

Ranking second in the world, just behind Italy, China has 48 UNESCO World Heritage Sites. In 2014 the United Nations World Tourism Organization (UNWTO) ranked China as the 1st more visited country in Asia, and 4th in the world, just behind Spain, USA, and France. In 2016 it is expected to receive 56 million international tourists and create 57 billion USD in revenue.

In order to contribute in the stimulation of international rural tourism in China from Ziquejie, a strong sense of sustainability must be anchored to the collective consciousness of rural habitants, government and national investors. Ziquejie is a potential world class rural tourism international destination which is in process to be nominated as the 49th China's UNESCO World Heritage Site.

3.2. Observations about Xinhua.

Locals refers to rural Ziquejie as a poor region, perhaps because it still being compared to urban development as if they were the same thing. Truth is that natural resources of Ziquejie, Xinhua, make

them truly rich. It is not the money what makes the difference, but the care of good natural resources management. Money will follow.

3.2.1. Bamboo resources.

Among many natural resources, bamboo is a high-light, specially Moso bamboo (*Phyllostachys pubescens* also known as *Phyllostachys edulis*). Surprisingly, this magnificent resource still sub-utilized in Ziquejie.

Even though Ziquejie, in Xinhua county, is a relatively small area, the amount of bamboo resources is quite enough to follow the biggest industries of bamboo of China.

China is number one industrializer and exporter of bamboo products in the world. In order to modernize the agrarian society of Ziquejie, is fundamental to learn bamboo management and enroll the region in the bamboo industry of China, following the steps of other regions that already achieve it with significant benefits for their regions. Fortunately, there is not too much to invent. Ziquejie can adapt systems that already exist, and improve within further years and local conditions.

Since ancient times, bamboo has played an indispensable role in societies where it occurs natively. It became almost an invisible part of daily life and an inseparable friend of traditional culture. The potential of industrialization of bamboo is a must due to the fast economic growth of China and the necessity of modernization of agrarian societies in order to complete the Socialism Market Economy reform process established in 1979 by Deng Xiaoping. Technically, everything can be made of bamboo.

The 4,842,600 hectares of bamboo forests in China sustain a bamboo industry of 2,500 million USD/year. In a proportional scale, enrolling the 22,000 hectares of bamboo forests of Ziquejie in the Chinese bamboo industry represent an initial capacity of 11.3 million USD/year.

China is the second country with more native bamboo in the world, and number one in industrial processes and export market. Demonstrating amazing performances in the modernization of rural economies in developing regions in China.

During the opening reform of the past 30 years, a full bamboo industry system from resource cultivation, processing and utilization to export trade has been formed in China; it is the rising-sun industry with great potential.

Devoting major efforts to the bamboo industry in Ziquejie is significant to accelerate the modernization of its rural economy, and to improve ecological environment eradicating poverty. It is necessary to break the old structure model of the rural economy in Ziquejie, and to adjust and optimize the bamboo industry structure for raising farmer's life level.

Bamboo resources are not only an important part of forestry resources, but also ideal resource for sustainable forestry management and utilization. Comparing with trees, bamboo has a faster growth, shorter rotation, bigger yield, highest strength and better fiber. Besides, bamboo can be used renewably and is sustainable once planted

For Ziquejie, to develop bamboo industry is beneficial for the optimization of production structure, promotion of rural economy and the increase of forestry and agricultural income. About 1.5 billion people depend on bamboo for their daily lives. Over 20 million tons of bamboo are collected and utilized annually. The rural areas are the prime harvesters of bamboo. Global bamboo trade is estimated to be between 1.5 to 2.5 billion USD. Although it occupies 2% of the total tropical and sub-tropical forest area, bamboo contributes with the 6% of the total tropical and subtropical timber trade.

Home of bamboo in China. According to Ministry of Forestry since 1996. (Hectares/Region)

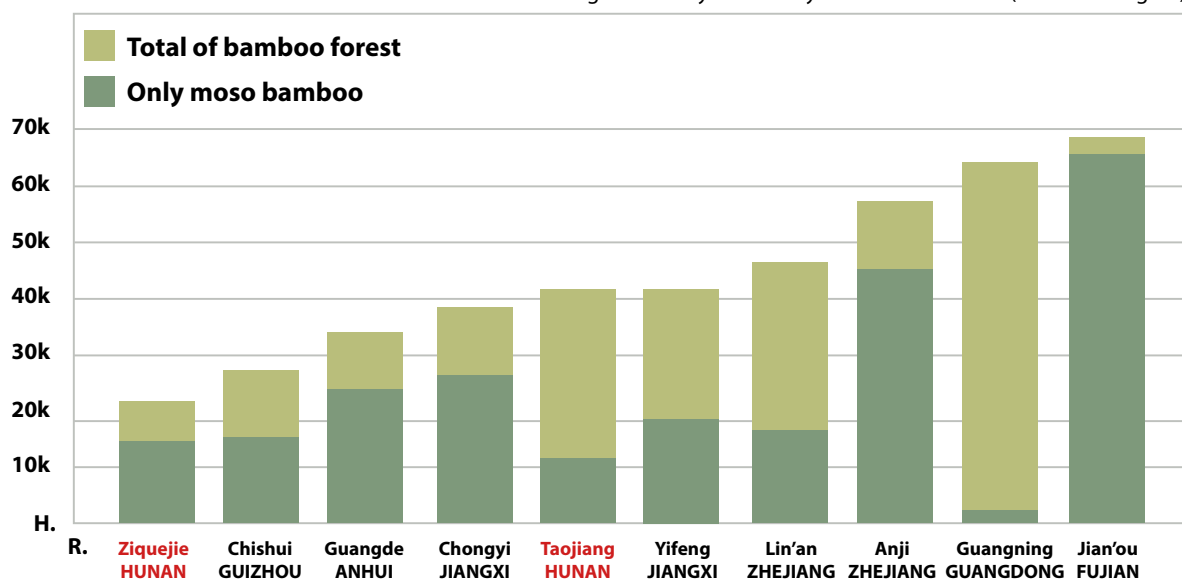


Figure 14: Home of bamboo in China.

Bamboo shoots have been widely known as good source of food because of their tastes and nutritional and medicinal values. Farmers and their families can harvest and process bamboo shoots for their own consumption and for income generation. There is a big demand for bamboo shoots both in local and export markets, especially in Japan and USA. China currently exports about USD 150 million of bamboo shoots annually. Bamboo also has gained acceptance as excellent material for construction. With the right management, bamboo buildings survive strong earthquakes and can remain for hundreds of years if project requires it. All bamboo wastes can be made into charcoal with simple equipment. This help to conserve fast depleting forest resources because villagers no longer have to cut scant wood resources for fuel.

China is facing challenges on poverty and environmental problems, that's why government have implemented policies to ban harvesting natural forest, which leads to a critical opportunity for the forestry sector to develop new forest resources to serve people both for livelihood and environmental improvement. With abundant bamboo resources, Xinhua is in process of adopting bamboo industry as part of rural economy modernization. Cultivating, processing and utilizing bamboo as a main resource for enriching the people and empowering the region. Thinking globally, acting locally.

3.2.2. Landscape and architecture.

For 2,300 years the high rice terraces of Xinhua have followed the contours of the mountain. The fruit of knowledge handed down from one generation to the next, and the expression of sacred traditions and delicate social balance have helped to create a landscape of outstanding aesthetic beauty that expresses the harmony between humankind and the environment.

Xinhua is located in the remote areas of Xinhua county, 310 km southwest of Changsha, capital of Hunan. Xinhua rice terraces are an amazing example of an evolved living cultural landscape. They all are the product of the Xinhua ethnic group, a minority community that has occupied these mountains since the Neolithic age. A priceless contribution of Chinese ancestors to humanity.

Reaching a higher altitude than many other terraces, the Xinhua terraces are composed by stone and mud walls carefully carved with natural contours of hills and mountains reflecting a mastery of

engineering to make terraced pond fields. They are coupled with the development of intricate irrigation systems, harvesting water from the forests of the mountain tops, and an elaborated farming system, now vulnerable to social and economic changes.

The maintenance of the living rice terraces in Xinhua reflects a primarily cooperative approach of the whole community which is based on detailed knowledge of the rich diversity of biological resources existing in the Xinhua agro-ecosystem, a finely tuned annual system respecting lunar cycles, zoning and planning, extensive soil conservation, mastery of the most complex pest control regime based on the processing of variety of herbs and accompanied by religious rituals. They offer many lessons for application in similar environments elsewhere.

The Xinhua terraces are able to be included on the World Heritage List by meeting at least one out of the following ten UNESCO selection criteria:

- (i) To represent a master piece of human creative genius
- (ii) To exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design.
- (iii) To bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared.
- (iv) To be an outstanding examples of a type of building, architectural or technological ensemble or landscape which illustrates a significant stage in human history.
- (v) To be an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of culture, or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change.
- (vi) To be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance.
- (vii) To contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance.
- (viii) To be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features.
- (ix) To be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals.

To contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation. From these ten selection criteria established by UNESCO, Ziquejie terraces apply for at least three of them, (iii), (iv) and (v):

- (iii) The rice terraces of Ziquejie are a dramatic testimony to a community's sustainable and primarily communal system of rice production and other crops, based on harvesting water from the forest clad mountain tops and creating stone and mud terraces and ponds, a system that has survived for four millennia.
- (iv) The rice terraces of Ziquejie are a memorial to the history and labor of more than a thousand generations of small-scale farmers who, working together as a community, have created a landscape based on a delicate and sustainable use of natural resources.

- (v) The rice terraces of Ziquejie are an outstanding example of land-use that resulted from a harmonious interaction between people and its environment which has produced a steep terraced landscape of great aesthetic beauty, now vulnerable to social and economic changes.



Figure 15: Rice terraces of Xinhua in summer.

The protection, management, authenticity and integrity of properties are also important considerations. Since 1992 significant interactions between people and natural environment have been recognized as cultural landscape.

Besides China, in the world there are several examples of rice terraces including Nepal, Pakistan, Peru, USA, Indonesia, Philippines, Vietnam, Thailand and France. However, only two of them are considered UNESCO World Heritage. The first is in Ifugao, Philippines. The other is in Honghe Hani, Yunnan, China; 1,100 kilometers from Ziquejie, Hunan. Some important competitive differences between Ziquejie and Honghe Hani are:

- Ziquejie rice terraces are about 900 years older than Honghe Hani rice terraces.
- Ziquejie is 1,000 kilometers closer to the developed area of Main China (Shanghai), while Honghe Hani is located in south Yunnan province, close to India. Almost 2,000 km from Shanghai. Easier for international tourists' arrivals.
- Ziquejie can apply for at least three UNESCO criteria (iii), (iv) and (v), while Honghe Hani is already registered with only two (iii) and (v).

Besides Cultural Landscape activities, Ziquejie can implement and offer new activities such as winter sports in snow, summer educational programs for children, and panoramic lifting; while Honghe Hani offers only Cultural Landscape activities.



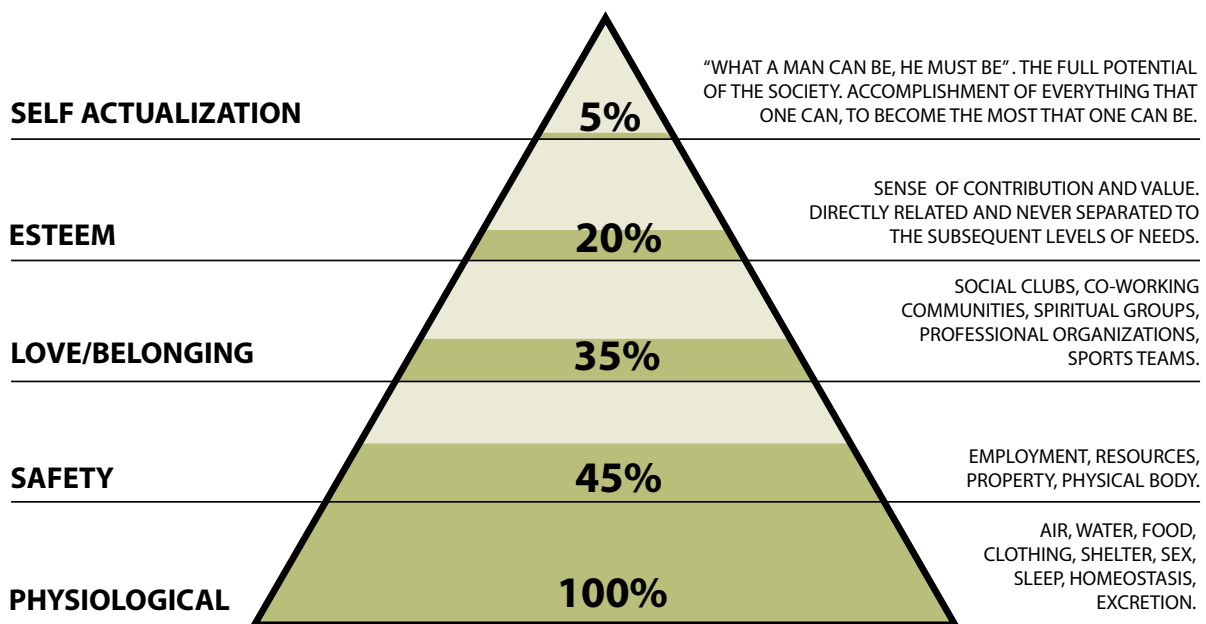
Figure 16: Left. Abandoned traditional building. Right. Domestic space with modern aspirations. Xinhua, China. 2015.

Ziquejie terraces and Honghe Hani terraces both share one cultural challenge caused mainly by the fast economic growth in large cities and slow adoption of Deng Xiaoping’s reforms in rural areas: New materials in houses, such as concrete bricks are replacing adobe; tiles are replacing thatched roofs. This has begun to impact on the overall environmental landscape. In recent decades, extraneous architectural styles have entered into the villages, causing some negative effects. In this sense, both Ziquejie and Honghe Hani are scoring low in the integral criteria of UNESCO, However, this misunderstood concept of “modernization” still can be rectified reutilizing abandoned traditional buildings for new uses, and sustaining support for local materials and techniques to create a hybrid inclusive architecture manifesting the coexistence between modernity and tradition, instead of separate them.

3.2.3. The Maslow pyramid in Xinhua.

The Maslow’s pyramid is a useful tool to illustrate the hierarchy of human needs in Ziquejie, from the bottom (physiological needs) to the top (self-actualization).

it is useful to clarify the situation in the area and to inform our decisions for the future. Maslow suggests that the most basic levels of needs must be met before the individual strongly desires (or focus motivation upon) the secondary or higher level of needs. However, the human society is complex and have parallel processes running at the same time, thus many different motivations from various levels of Maslow’s hierarchy can occur at the same time. But usually, a certain need dominates the human society. Maslow focused on identifying the basic types of motivation and the order in which they should be met. In Ziquejie, the 5 levels of satisfaction of human needs looks like this:



The need that dominates the society of Ziquejie is the Economic Safety Need (45%) due to the fast economic growth of Chinese cities, the slow adoption of 1979's reforms and the rural-urban migration. It is essential to attend this need in order to move forward to next levels.

41%
Average

Figure 17: Maslow pyramid in Ziquejie, Xinhua, China. 2016.

Physiological needs. Are the physical requirements for human survival (air, water, food, clothing, shelter). If these requirements are not met, the human society cannot function properly and will ultimately fail. Physiological needs are thought to be the most important so they should be met first. Ziquejie is absolutely complete at this level.

Safety needs. With the physical needs relatively satisfied, the society's safety and security needs take precedence and dominate behavior. The main kinds of safety are: physical safety, economic safety. For physical safety, Ziquejie is relatively ok. Usually physical safety is referred due to war, natural disaster, family violence, childhood abuse, etc. According to the historic records, the last battle near by Ziquejie was in 1950, November – *Campaign to suppress bandits in the border region of Hunan-Hubei-Sichuan*. So, no need to consider this. Ziquejie is already recovered. However, closest analysis must be done in order to identify if there's still family violence or childhood abuse in the community. In the other hand, Ziquejie can be found in economic crisis situation due to the fast economic growth in cities and slow adoption of reforms in rural. However, it is solvable with rural tourism development and education for utilization of local resources.

Love and belonging needs. After physiological and safety needs are fulfilled, the third level of human needs is interpersonal and involves feelings of belongingness. In other words, social cohesion. Some examples of small social connections include family members, intimate partners, mentors, colleagues, and confidants. Some examples of larger social connections include social clubs, co-working communities, spiritual groups, professional organizations and sports teams. In the absence of love and belonging needs individuals in society will become susceptible to loneliness, social anxiety, and clinical depression. Ziquejie has a long history, so the belonging needs are quite developed,

however, the same rural-urban migration phenomenon is challenging Ziquejie about its social identity. Kung fu practice is very famous in Ziquejie, also co-working communities is a strong base in the area, however is necessary to improve the professional organizations and rise the level of the sports teams.

Esteem. All humans have a need to feel respected. This includes the need to have self-esteem and self-respect. Esteem presents the typical human desire to be accepted and valued by others. In order to evaluate the esteem needs in Ziquejie we have to look in how often people engage in a profession or hobby to gain recognition. These activities give the person a sense of contribution or value. Ziquejie still need more variety of activities, professions and crafts in order to cover well the esteem needs. Rural tourism and local resources management seems to have enough content to work on it. As we can see, the subsequent levels of needs are closely related (and never separated) to the esteem needs.

Self-actualization. “What a man can be, he must be” This quotation forms the basis of the perceived need for self-actualization, or self-transcendence. This level of need refers to what a person or society’s full potential is and the realization of that potential. Maslow describes this level as the desire to accomplish everything that one can, to become the most that one can be. Ziquejie may focus on this need very specifically. For example, if the region has a lot of sub-utilized bamboo, then Ziquejie may have the strong desire to become an ideal bamboo producer. This desire may be expressed athletically. Another example in Ziquejie is the development of rural tourism maximum potential, it includes to stimulate the Ziquejie organizations in order to become the #49 UNESCO World Heritage Site. To understand this level of need, Ziquejie must not only achieve the previous needs, but master them. If succeed, then Ziquejie will be able in giving itself to higher goals outside oneself, in altruism and spirituality.

And that's it!

The scores established in this paper are subject for discussion due to a lot of information that still need to be searched in deep work and close interaction with the community for relatively long periods of time. However, this first approach to the level of needs of Ziquejie illustrates well enough where we are in terms of social cohesion. Feedbacks are highly appreciated.

Even though all levels of needs are present in Ziquejie, the need that dominates the society of Ziquejie is the *economic safety need* due to the fast economic growth of cities in China and the slow adoption of Deng Xiaoping’s reforms in the area. So, is dramatically important to focus efforts in solve the economic needs through a responsible management of local resources, establishing new industries such as bamboo industry and rural tourism industry through educational programs and creation of new activities. Money will follow.

3.3. Actions to take in Xinhua.

Agrarian society in China has a bright future. Xinhua has everything needed to succeed. And the aspirations of population are close enough to the resources. This region, as well as all the developing countries of the world, is facing the economic challenges with great attitude and outstanding energy to actually make it happen.

3.3.1. Re-utilizing abandoned traditional buildings.

In the last two decades, the aspirations for modernity of rural habitants in Xinhua have brought estrange typologies of domestic and public infrastructure. An excess of imported materials such as concrete bricks and plastic imitation of wood is contributing to the decrement of utilization of local materials, and the landscape is hit hard. At the same time, a considerable amount of traditional wood buildings is sub-utilized or even abandoned.

In order to develop a sustainable tourist industry is essential to consider the recent events in order to collectively direct them into the balanced path. The income of the rural-urban migrants is a key factor. Instead of buying an excess of imported materials with inflated cost, a considerable part of it shall be applied to re-utilize abandoned traditional buildings, which at the same time will strength the beauty of the rice terraces, reduce visual pollution, stimulate national and international tourism, and close the gap between traditional and modern. This aims to contribute in the modernization of the agrarian society of China, since it has always been the first and foremost issues for Chinese governments.

Dr. Chaio, from School of Architecture of Southeast University, Nanjing, said in December 2015 after her personal visit to Ziquejie, that is *imperative* to create programs in order to rescue old abandoned traditional buildings and adapt them into new functions for educational and touristic interests, such as public libraries, schools, hotels and/or restaurants.

The renaissance of Ziquejie can relay in the re-direction of how to construct infrastructure. In traditional Chinese medicine, five steps process are requested to heal the organism. If not a human body, but a human society: (1) Stop the crisis, (2) remove the cause, (3) balance the organism, (4) cleanse and forgive, and (5) strengthen and rejuvenate. For Ziquejie, it would look more or less like this:

Stop the crisis (1).

The first necessity is a compassionate response to the suffering and a desire to provide relief. The suffering for Ziquejie might be the lack of money and quality of life compared with cities. The desire of relief is manifested in the accelerated construction of estrange architecture built mainly with imported materials commonly found in urbanity.

The attitude of acceptance allows movement from suffering to the possibility of transformation. The seed of healing is contained in the patterns of experience. In this sense, is fundamental to attract experts in related topics with a positive attitude to acknowledge about this issues and create conscious within the community.

If the pain of Ziquejie is the lack of money and the low quality of life compared with cities, then it is reflected in Ziquejie's architecture, since architecture is the physical manifestation and witness of history. The chronic pain becoming more intense is the society's call for help.

Remove the cause (2).

The first and main cause of disease is always the violation of natural law. This will interfere, block or disturb the flow of life. With this in mind, we need to be more specific and differentiate between the external and internal causes of Ziquejie's disease.

The main internal causes are:

Heredity: New generations dealing with the acts of ancestors.

Stress: Unsufficient answers to the current challenges

Lack of awareness: Education is essential. Learning to think global acting local.

Mental factors: Mentality is the source of every act. Improve it.

Pain: Emotional, economical, social, environmental.

The main external causes are:

Toxicity: Garbage in scenic sites. Over consumption of Tabaco or alcohol.

Trauma: Deforestation and unplanned construction.

Deficiency or excessive nutrients: This is not achieved by eating more or eating less, but choosing better what to eat, no matter the amount of food, what matters is the combination of ingredients.

Perverse energy: Radiation from electrical power lines over the fields.

Removing the cause of illness or pain is critical. If no action is taken and the cause is not addressed, the mechanism of denial or unconscious social repression occurs. Symptoms may then reappear in the physical landscape or habitants mind in distressing ways, even though the original symptom has been treated.

Balance the organism (3). Reutilization of abandoned buildings utilizing local resources. The creation of academic rural programs as an affordable way to study and design new uses according to market necessities, local resources, and modernization anchored to tradition, instead of separated of it.

Cleanse and forgive (4). As I explained in previous chapters, Ziquejie must coordinate itself to achieve the highest international standards of Cultural Landscapes which are found in UNESCO. Ziquejie has a fair potential to become the #49 UNESCO World Heritage Site of China, in the Cultural Landscape category. It will establish a mental social structure which might make everything easier, since is clear what to do, and the behaviors that are needed to achieve it. Once tourism and bamboo industries are amplified in its true potential, social cleanse will be just like a hot knife cutting butter, and forgiveness for previous acts will happen naturally.

Strengthen and rejuvenate (5). The process of economic, ecologic and social improvement shall continue for ever. Now the social mind-set is adapted to the environment and now is easier that new generations respond to the local natural conditions and to the national and international tourism market demands.

The reutilization of abandoned buildings is intimately linked to a utilization of local resources culture. It is a way not only to dramatically reduce cost of construction, but to increase the value of the buildings and also increase the interest of foreigners to visit. Doing so means to align into the biggest new business in history: Sustainability.



Figure 18: Left. Old building reutilized in modern rural commodity. Right. Local soil wall.

3.3.2. Organizing bamboo plantations.

The potential of Ziquejie to get enrolled in the Chinese bamboo industry is almost obvious, because the natural resources are so abundant and totally available. But is much more than only natural resources to succeed on this goal. The psychological motivation of locals is crucial in order to hit the plan strongly. Locals must be asked by researchers about what are their dreams and deepest aspirations, first as individual, then collectively.

If local habitants are not psychologically motivated, then the success options are dramatically reduced to 0%. The main psychological motivations to push collectively the bamboo industry (taking advantage of their local resources) are: better incomes and better quality of life.

In December 2015 Dr. Ding Yulong (Bamboo expert from Nanjing Forestry University), listed three main advices in order to kick-start the industry:

First advice. The intention of locals to cooperate with personal amounts of money coming from their own pockets is an enthusiastic attitude, but not enough. The goal of organize natural bamboo resources to create productive bamboo plantations requires the benevolence of Government investment and business man investment.

Second advice. Even though bamboo has hundreds of useful applications, the new productive bamboo plantations shall focus in wood and shoot, considering two things. First, the wood market is decreasing its value (but still a must to develop). It does not mean that is not worthy to produce bamboo for wood purposes (actually is necessary), it only means that the biggest profit will come from shoots. The bamboo shoots must be considered as a “cash crop” (an agricultural crop which is grown for sale to return of profit). This means an intelligent adaption of the natural forests into productive forests. Following the methods documented in the book: “Moso Bamboo Management”, attached in the reference chapter of this article.

Third advice. 20,000 hectares of bamboo forest in the region. Yes, Ziquejie has abundant Moso bamboo (the most productive bamboo specie of China and the world). Ziquejie must develop relationship with the few big factories in the nearest regions (Taojiang, Hunan) where the bamboo industry is already running successfully. Moso bamboo, as the main resource for hundreds of export-quality products, is constantly demanded by factories. Ziquejie shall provide the valuable resource, and eventually create branches of factories within the region. Ziquejie, an international supplier of bamboo products? Absolutely yes. But first must supply locally, then regionally, then internationally.

Growing attention of the global markets to bamboo commodities is a relatively new phenomenon. There is an increasing interest in sustainable economic, social and environmental development. Moso bamboo is an excellent resource for promoting sustainable growth, international trade and inter-disciplinary cooperation.

The recent development of bamboo is often called “golden revolution” analog of “green revolution”, which solved world food security problems in 1970-1980s. The ongoing “golden revolution” in Ziquejie may help to solve global wood security problems and reduce environmental pressure on forest. Growing international bamboo trade is an indication of the importance of bamboo for the nations.



Figure 19: Dr. Wang Guo-An (Zhejiang Gongshang University) testing bamboo diameter. Right. Dr. Ding Yulong (Nanjing Forestry University) collecting bamboo samples. Xinhua 2015.

3.3.3. Introducing bamboo architecture.

We are in Xinhua, but for a specific purpose we will focus in the small village of Ziquejie. In order to effectively stimulate the bamboo culture enclosing familiarity between locals and bamboo in Ziquejie, is important to implement new uses of it as a material. Usually is only utilized in baskets, kitchen tools, charcoal, or simple shelters for chicken or pigs. However, bamboo has demonstrated to be much more than that.

Bamboo utilization in Ziquejie still quite simple. If we compare the utilization of bamboo in Ziquejie to the potential of bamboo utilization, we can say that Bamboo applications in Ziquejie are nearly none. Some very basic utilizations we might find in the region, such as simple tools or even small shelters for pigs or chickens. In order to contribute in the modernization of rural Ziquejie, bamboo shall be applied with knowledge of better use to local resources.

Nowadays, because its outstanding mechanical properties, Bamboo is considered the vegetal steel with amazing applications in construction. Examples of construction with bamboo as the main structural material are numerous in the world, and its popularity is increasing quite fast thanks to its friendly eco-impact, sustainability, and amazing mechanical properties.

Ziquejie, with abundant bamboo resources, and with its crisis of architecture and landscape because the imported and expensive materials and estrange unsuitable styles, is up to experiment with bamboo as a new (but old) construction material to build infrastructure in different scales. Part of this research is a personal visit to Ziquejie in order to stablish a simple (but not easy) strategy to begin with the utilization of bamboo as a construction resource. This aims to reduce the import of expensive materials such as concert, steel, or even regional wood, meanwhile building strong infrastructure useful

for the community and tourism, with an aesthetic beauty suitable to the magnificent terraces of the region.

However, it is important to clarify that bamboo by itself can not do everything. Bamboo must be combined with other construction material such as concrete, steel and/or wood, but these materials will perform only in small and crucial joints of the structures, and not as the predominant aspect of bamboo structures in rural Ziquejje. Concrete and steel will become allies to the reinforcement of beautiful bamboo architecture. Also, bamboo contributes seriously in the reduction of tree logging and conservation of forests.

In the last 30 years' bamboo has gained acceptance as excellent material for construction. With the right management, bamboo buildings survive strong earthquakes and can remain for hundreds of years according to design requirements. All bamboo wastes can be made into charcoal with simple equipment. This helps to conserve fast-depleting forest resources because villagers no longer have to cut scant wood resources for fuel.

In order to begin to introduce the bamboo architecture culture in Ziquejje, it is fundamental to construct a few real demonstrations of bamboo structures in Ziquejje. The Ziquejje community have already begun to follow two simple processes: the creation of the bamboo stock for construction, and the creation of suitable design processes to utilize such stock.

3.3.4. Seven steps to create the bamboo stock in Xinhua.

To increase the durability of Bamboo and to protect it from insects and fungal attacks, it is necessary to carry out reliable preservation of every Bamboo pole. Bamboo shall be treated with naturally occurring salts of BORAX (Sodium Borate) which is safe and environmentally friendly preservation chemical. This technique has been applied in *Guadua Angustifolia* Bamboo, the hardest and strongest bamboo for construction. However, Moso bamboo for raw construction is also very good, but not as strong as *Guadua Angustifolia*, but strong enough to build architecture, for sure.

To load the bamboo culm with sufficient levels of these salts for wood preservation we "horizontally immerse" the bamboo culm in a 5% solution which is a fast and reliable method to ensure to use the best material possible. To build bamboo structures, first, it is essential to follow the next steps: Selection (1), Wash (2), Drill (3), Mix (4), Bleach (5), Dry (6), Sort (7).

Selection (1): Start by individually hand-selecting mature Bamboo Culms (4-6 years old) in the Xinhua Forests. This is important because the Bamboo will have sufficiently hardened (lignified) maximizing the physical properties of Bamboo. These mature poles (4-6 years old) also shrink and crack less when dry, and have a lower starch content and fewer insects and fungi.

Harvest as indicated below:

- Harvest immediately after a rain season ends
- Harvest between the 6th and the 8th day after full moon.
- Harvest between 4pm and 6am.
- Cut as close as possible to the base bottom of the Bamboo Culm (First Node).



NO! / YES☺

Figure 20: How to log bamboo

Wash (2): To prepare the poles for the treatment process we first clean the poles with a pressure wash pistol. **Photo (2):** Simply collocate bamboo horizontally to let them receive the pressure water ensuring cleanness.

Drill (3): Next we longitudinally penetrate the diaphragms of each bamboo culm. We attach a large drill to a long steel rebar and drill each node throughout the length of the Bamboo. This allows the preservation Solution to fill up inside the hollow Bamboo and allowing the Borax Solution to diffuse via Osmosis into the soft interior wall. **Photo (3):** Drilling each node throughout the length of the Bamboo with a large drill

Mix (4): First, prepare a Pool of 13m Long and 1.2 m Deep to treat 12m long Culms. Then mix 5% of borax (Sodium Borate). Borax is a soft, colorless, powdered mineral that is dissolved in water and used as the primary wood preservative in the Highest Quality Bamboos for Construction. The drilled bamboos must stay completely immersed in the mixed water for 5-6 days. This horizontal emersion technique works with the anatomy of the bamboo culm and allow the preservative to penetrate deep into the bamboo wall and load the entire culm with sufficient salt levels to deter any fungal or insects attack. **Photo (4):** Mixing 5% of BORAX in a pool 13m Long. 1.4m Deep.

Bleach (5): The bamboo poles are left to bask in the sun for 1 or 2 or 3 weeks, depending on the amount of sunlight in Ziquejie. Rotate twice per day to avoid cracking and achieve a homogeneous color. The sun bleaches the chlorophyll in the bamboo to get a golden yellow color that is more desirable as a construction material. If rain comes, its recommendable to cover them with big plastics to avoid further new humidity in the poles. **Photo (5):** Bamboo poles exposed to the sun.

Dry (6): Once bamboo poles are bleached, they will be stored in a dry, dark place to undergo hot air Injection using a hot-air compressor connected to hundred hoses. Each hose will be connected into a single drilled bamboo culm. For fast efficient drying of bamboo poles, that rapidly decrease the humidity 2.3 % per day. **Photo (6):** Hot air compressor connected to hundred hoses connected to every drilled bamboo culm.



Figure 21: Immunization process for bamboo.

Sort (7): Now that the bamboo poles are Dried to 12-18% Humidity. Keep them all under dry shade and moderately ventilated Storage. Without touching the ground. Organize the stock according to high quality poles and lower quality poles. Cut to length and mark with paint color the base of the poles per diameter. Example1: Diameter 6cm=blue. Example2: Diameter 10cm=red.



Figure 22: Bamboo stock organization for construction.

And that's it! Now we have the highest standards of raw bamboo for construction. These techniques are proved and can be found in the highest quality raw bamboo constructions in the world. Bamboo materials are ready to be applied in architectural designs.

3.3.5. Design ¹⁰process for bamboo architecture.

In order to anchor advanced studies in architecture in rural society's, and avoid any possible misunderstanding of what "suitable" means for architecture and landscape in Ziquejie, it is essential to stimulate the university participation and local craftsman training in an affordable way. In this sense Ziquejie is n amazing architecture laboratory for real practice. This system is proven in several developing countries with amazing results and success, with countless benefits for the rural societies as well as education of the up-coming generations of designers.

The design process most be a participative process where local in rural Ziquejie provide accommodation and food for students and professors who will apply time and knowledge to design and construct new infrastructure. The goal of establishing these programs is to empower locals with self construction skills using local resources, reducing costs, time and improving the aesthetic value of the landscape. A cross cultural communication will be tested by students with the local habitants. Both locals and students are equal contributors to the designs process and construction.

In order to build bamboo architecture in Ziquejie, a series of exercises and tests are essentially important to inform the design decisions. It is essential for the university students to follow the next steps in collaboration with locals of Ziquejie: Observation, formulation, successive answers, project and construction.

Observation

Date 1. Design studio meeting.

- Talk about the Region.
- Talk about the required infrastructure.
- Definition of teams.
- Distribution of Documents.

Date 2. Presentation of first exercise. Question: "How is the site?"

Students make a photographic montage of 10 shots composed as one image that reflects the fundamental argument of the site. This exercise serves as a narrative document that is inclusive of the things that have caught more our attention. These things can be, but not limited to, movements, density, rhythm, adjacency, undulation, views, etc. Students are invited to mix various scales and to manipulate the images accordingly but minimally in Photoshop.

Requirements: The final document should be in digital format, printed in color. The image should be 55 cm in width and an undefined height. Audio-video montage is a plus. All group works will be collected digitally in a single format.

Date 3. Presentation of second exercise. Question: "What is the project?"

¹⁰ "Design" is the creation of a plan for the construction of an object or system. Design often necessitates considering the aesthetic, functional, economic and sociopolitical dimensions of both the design object and design process. It may involve considerable research, thought, modeling, interactive adjustment, and re-design. Equally important is the method of design than the outcome.

Students make a compilation of project-examples that synthesize the main aspect of the required infrastructure. Including: Plans, sections, sketches, critical conclusion and a new direction for further design.
Requirements: The final document should be in digital format, printed in color. Size A2. Audio-video montage is a plus. All group works will be collected digitally in a single format.

Formulation

Date 4. Presentation of third exercise. Question: “What are our subliminal influences?”.

Students document briefly the initial ideas about the project, making two graphic sketches. The first, about relationships and conflicts that will be established in the project. And the second, the questions and interests that the project will encounter. This exercise shall define the interest fields more than the solutions.

Requirements: The final document should be in digital format, printed in color. Size A2. Audio-video montage is a plus. All group works will be collected digitally in a single format.

Successive answers.

Date 5. Presentation of fourth exercise. Question: “How can we start the project?”.

With an intuition, a color, a sound, a light quality, an idea on the exterior space, or interiors space, a texture, a sensation, a memory, a usage, and/or habits or rituals induce to the new users? The following series of exercises are to target a specific aspect of the project.

Light. How does light enter into the project? How does light alter in space and time? How shades and shadows produced by light influence the space? Which devices are appropriate to the project? How are the “windows” of the project?

Materials. What color(s) and texture(s) is the façade made up of in the project? Which are the materials to be used?

Furniture. Design briefly a furniture type for the project. Can we go deeper into an exercise of ergonomics before the project is designed? *Requirements:* Each exercise will be presented in A2 size panel. All group works will be collected digitally in one single format. Every one of the small projects has to contain enough information in plan, elevation, section and perspectives or photographic montages to understand clearly the intentions that are being investigated. The scales will depend on each of the subject and it will be detailed with precision as the project is being developed.

Project.



Figure 23: Bamboo architecture arriving to Xinhua. Structure by Marck Emery.¹¹

Date 6. Presentation of fifth exercise. Question: “What’s our interpretation of the project now?”

With the assumptions of the previous exercises (site, influences and details) this exercise is to review our understandings of what a pavilion or a duck shelter is, and to return to the scale of the required project. What beliefs and ideas do we have now of the above that reinforce or contradict the project? Students will illustrate with diagrams these reconstructed concepts. *Requirements:* An illustration in A2 panel describing the above mentioned.

Date 7. Presentation of sixth exercise.

With the idea of the previous final reviews to the preparation of the presentation material the exercise of OBSERVATION will be repeated. This new version will be understood as an architectural and theoretical reference map to define the material from the site studies as in any other document. *Requirements:* 3 panels size A2.

Date 8. Presentation of seventh exercise.

Students make all necessary illustrations and diagrams to present the project and its construction strategy.

¹¹ Marck Emery. French bamboo architect living in Thailand.

Requirements: 3 Panels size A2 with diagrams, site plan, building plan, sections, elevations, model.

*Construction.*¹²

Date 9. Execute the planed project.

Travel to Ziquejie, Xinhua, Hunan, China.

Requirements: In site, take measures, compare with the given information and adjust the parameters of design into real conditions. Selection, compilation and quantification of previously preserved bamboo material for specific use.

Construction of foundations, mainly with concrete and steel.

Build the project model scale 1:1.

Finishes, details and polish.

Public test and demonstration.

Time for construction: 11 days.

The following picture is an example of previews experience building with raw bamboo for rural communities. It is a duck shelter to rise the quality of production and life for the animals. Designed and built only with local resources in Lin'an, Zhejiang, China.



Figure 24: Bamboo duck shelter. Contribution to the ducks raising in rural Lin'an, Zhejiang, China. (April 2015).

¹² Construction: The ability of bamboo buildings to go back to earth without harm of the environment is something positive. In that sense it is essential to combine the building process with a training of local craftsman.

4. Expected results

This is a Landscape Architecture thesis. However, we can not ever ignore adjacent fields such as economy, commerce or agriculture, for example. It is the relationship between disciplines which construct communities. The social cohesion between us will take us to the next level. In this case, the landscape architecture will emerge as a resultant of analysis and actions taken afterwards. The obligation of this thesis is to jump out of the paper and to emerge in reality. Theory without practice is nothing. It needs real markets, real landscapes, real societies. That's why this thesis is only a beginning, a point to start. A map. To design a landscape project without a business model is empty. Coming up next, please review these social business proposals that shall influence society and as a resultant our landscape and architecture will be influenced dramatically. So first we propose a social business, then we mark the expected results in its landscape as a consequence. Here we go.

4.1. Bamboo plantations social business in Sinaloa.

Recalling the chapter 1.3.3. *Social business*, in order to actually be a social business it shall recall a social problematic and solve it in a social business. In this case because in Sinaloa the problematic is the food supply, and food supply is basically agriculture, and agriculture in essence is landscape, then is the strategy to design our landscape architecture. Yes, we will design landscape architecture from an agricultural and commerce point of view.

Building a social business in Sinaloa is about creating an enterprise that its main goal is to solve the problem of the frosts winds in order to ensure the food supply of Mexico and South of U.S.A. It is about the introduction of a new specie of bamboo brought from Costa Rica (central America). The business begins from the introduction of the main productive specie that will resist the frosts in Sinaloa and provide food and wood for Mexico and U.S.A: *Dendrocalamus Latiflorus* Bamboo. It is native from Taiwan but will be imported from Costa Rica (Central America).

Because it is about the introduction of a new specie in Sinaloa, is necessary to create small test to achieve the quality of the cultivation. Once we achieve quality of cultivation then we go for quantity. By quality I mean no more than 500 m², by quantity I mean in a first step 50 hectares, second step 350 hectares, and later if possible reach the maximum amount available in Sinaloa 170,000 hectares. But any business first must, must, must begin small and handable.

The first 3 years is about managing the first 500 m² of *Dendrocalamus Latiflorus*. Please refer to the chapter 2.3.1. Establishment of bamboo plantations in Sinaloa.

After the first 3 years, once the *Dendrocalamus Latiflorus* feels comfortable in the Sinaloa's soil and environment, then we will begin to propagate the 50 hectares available in Sinaloa for this experiment. Remember, we are building a social business, this is a commercial plantation that solves environmental situations, it is not charity. In order to make it works, the business shall perceive incomes, but these incomes are not dividends, these incomes are reinvested in the same business in order to make it grow and grow.

4.1.1. Further landscape in Sinaloa.

Once the social business is installed and running, by economic nature it is only a matter of time that the community will begin to develop it self in a new path, not only in the economic, but economic become infrastructure. This infrastructure shall be the new reflection of our informed decisions. We need the practice and the experience of the further years to develop the proper conditions in order to see deep transformation in several aspects of the physical landscape architecture. We envision together that the master plan designed by Frank Lloyd Wright is highly suitable to the agricultural fields of Sinaloa. Seems almost as fantasy, but is so close to reality. Yes, we can replicate the design of Frank Lloyd Wright in order to adapt it into Sinaloa's circumstances. But once again, and please let's be clear about this; it is not the physical drawings what defines the master plan from the beginning, but the care for

healthy social businesses that operates within the intervals of commons sense. It is capitalism and communism living together. Why not?



Figure 25: Living City Sinaloa (2035).

As a resultant, the physical landscape will reflect the social business that runs it. Low density communities with open spaces in effective communication systems. Clean electricity resources, and abundant bamboo plantations for national consumption and exportation principally to U.S.A. The Offshore Wind Energy will play a key role. Not only for the water distribution but for the full supply of green electricity, since now it is cheaper than the electricity produced by fuel combustion. The weather will balance it self. Since bamboo provides enough biomass to create inedited microclimates, imagine what it can do in land that was designated to erode over the next decade. Yes, this means the recuperation of fertile soil and the possibility to keep the cultivation of so many crops.

The Living City is a garden city. Is beautiful, productive, self sufficient and harmonious. It is an example of how cities most and will look like in the future. It involves a huge change of geopolitical paradigm, in an open, humbler and stronger community. Prosperity and wealth. Aesthetics and technology.

In 1958, it was a utopia. Even in 2012 it seems a far away dream. But today, today is just next door, and we might be alive to experience it.

4.2. Bamboo architecture social business in Xinhua.

For Xinhua, the social business is also related to plantations, since Xinhua must take advantage of their natural moso bamboo resources and integrate it into the 2 billion USD per year of bamboo products export business in China to the world. However, before the plantation program in Xinhua, first is necessary to introduce bamboo as a highly productive and useful ally for community in order to eradicate poverty utilizing it. But, how to introduce bamboo into the mentality of Xinhua people? Well, since always, infrastructure is the way of habitants to interact into the environment. Infrastructure is the interface to deal with weather. Architecture is the science to bring into reality what is in thoughts. Bamboo is the main resource of this architecture in this place. But, what to build with bamboo in Xinhua? Well... Xinhua, as a developing region is trying to figure out how to develop education and tourism.

To build bamboo architecture is not as easy as it seems. It requires training of local craftsman within a strong mentality of cooperation and progress. The way to create the first social business of architecture in Xinhua is, first, work as volunteers to introduce de basic techniques of bamboo construction for strong structures, really strong, strong as steel, no kidding. Then, build teams composed by local trained craftsmen, professional architects, and investors. All are key factors. The organization to begin the social business in Xinhua will be in charge of selecting and cutting forest moso bamboo as indicated in chapter 3.3.4. *Seven steps to create the bamboo stock in Xinhua*. Then, according to requirements, the architecture team will study and design specific projects such as schools, hotels, housing, animal shelters for production, bridges, and pavilions, with the highest construction standard found in the world.

This social business will be run in a small but fundamental part by international architects from Colombia and Mexico, because in those places are based some of the better trained bamboo architects in the world. In the second stage of the social business of architecture in Xinhua, bamboo modules will be manufactured in line productions with specific standards of quality in order to supply bamboo structures in an easy and faster way for habitants and demanders of this art craft, since it is attractive for tourism, and suitable for education. Bamboo architecture aims to educate in topics of “thinking global, acting local”. Bamboo architecture will bring international education in the locality. Bamboo architecture will host international programs for education for foreigners and locals. Will be the most attractive natural scenery of china with modern but yet green architecture in the beautiful rice terraces of Xinhua.

This social business is going to provide the sufficient income to support locals craftsman into new economic activities achieving results that they can see with their own eyes in daily bases. For the first five years, we will be able to offer amazing bamboo hotels of 3-5 stars’ quality for national and international visitors. Also bamboo architecture will allow to be as flexible and natural for the environment that international tourist will feel so attracted to come. It will be a fantasy world of the future, today. It will be a model to follow. It will be a modernized agrarian society, and for the first time, China will be able to close the gap of economic wealth between rural and urban.

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A concrete idea about a social business running in Xinhua, is a company dedicated to the fabrication of bamboo modules for construction. It would provide a construction solution in a sustainable manner, with higher aesthetics and cheaper price.

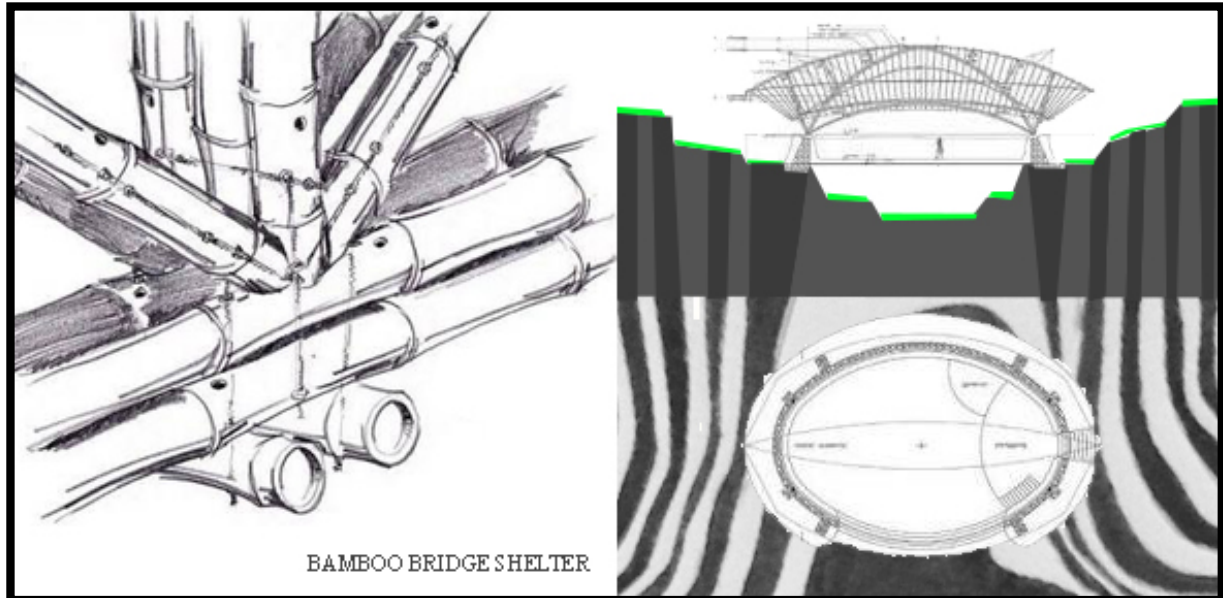


Figure 26: Bamboo bridge shelter. Xinhua 2016.

Here are some relative construction models, which concept about how to build over the rice terraces with the minimum impact on soil. More ideas are in process. Feedbacks are highly appreciated.



Figure 27: Bamboo hostel. Xinhua 2016.

4.2.1. Further landscape in Xinhua.

Imported and expensive materials (concrete or steel) shall keep existing in Xinhua, however the utilization of them will reduce dramatically from 100% to only 20% because these materials are

useful for specific and punctual purposes, but not for all the buildings, simply because it harms the environment as we explained in previous chapters. The utilization of local and natural resources such as soil for walls or bamboo for structure and crafts, will increase the value of the infrastructure. Or better said, locals will learn how to add value to resources that were taken for granted before. That is the greatest asset of all this plan. To teach and learn how what we already have can become a high value good. This will stimulate imagination of developers. Students and professionals will be attracted to contribute in outstanding buildings with the direction of utilize local resources with an accurate amount of imported



Figure 28: Duck shelter bridge. Building with minimum impact on soil. 2016.

The migration phenomenon of Xinhua will also reevaluate the situation. This migration phenomenon will be seen as something positive, since each one of the migrants will be considered an ambassador of Xinhua. Xinhua landscape will be motive of pride, and the status of rural Xinhua people will increase dramatically in the urban areas. The productivity of activities such as agriculture, or animal raising, will be branded and exported as high quality goods. The value of ancestors will align to the future and never be forgotten again. There is a story about a tiger which use to live in the bamboo forests of Xinhua. It used to be seen a lot by local farmers in Xinhua, but since more than one hundred years he has been lost of sight. They say that tigers in that region extinguish, however the tiger still there, but locals couldn't see him anymore because their eyes where focused in the money growth of urban regions so happens the migration phenomenon. Tiger still exist but has no observers. Now, with the connection of local resources (cultural roots) and economic growth, tiger is seen again and shines in the bamboo forests at nights. Tiger use to travel among the dreams of locals and visitors, and is seen only by those who will to align into the new era of progress and wealth.

5. Conclusion



Figure 29: Conclusion picture.¹³

5.1. International market competence.¹⁴

It is never recommendable going into a market that has no competition. If others are selling information similar to yours, that is excellent for you. Here is why: They have validated the market. You know there is profit to be made. You can market their products as an affiliate. They can become your top partners later and they can promote your product for you, too. You want competition. Competition is excellent.

We all know that China is the champion of the world in bamboo products exporting, by far. We also know that in Sinaloa the bamboo industry is just beginning. If the principal importer of bamboo products of the world is U.S.A. Around 4 million Chinese people live in U.S.A. Specially in California, the principal consumer of bamboo products of U.S.A.

California shares border with Mexico. Sinaloa is 800 kilometres far away of California, unlike China 13,000 kilometres.

5.2. Deadlines.

A limit of time -deadline- must be established in order to compress time and make things happen. It is scientifically proved that any project that has no-goal in short period of time, will never happen. The definition of goals and times for the projects must be discussed between Xinhua leaders, government, entrepreneurs, volunteers, and related people, making this event as public as possible (social interest) in order to make every and each habitant participant in this collective vision looking forward to a brighter future for the next generations, thinking global, acting local.

Here three examples of goals and deadline implementable in Xinhua.

¹³ “Stories about tigers walking among forests are many. For years, nobody has seen any. They only dare to appear in dreams, glowing in darkness, waiting for us to forgive our madness” Anonymous.

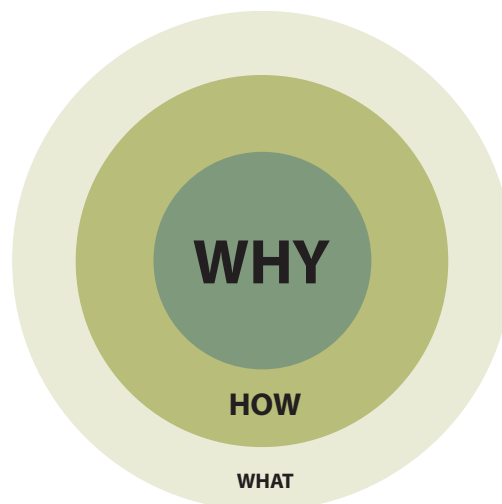
¹⁴ To create under the non-conditions, competition is the key. –CBRC, Hangzhou, China. 2012.

The UNESCO nominations for World Heritage Sites are open each year in February. Within this time the collection and preparation of documents can be tracked. UNESCO encourage State Parties to submit their Tentative List of properties which they consider to be cultural and/or natural heritage of outstanding universal value and therefore suitable for inscription on the World Heritage List. States Parties are encouraged to prepare the Tentative List with the participation of a wide variety of stakeholders, including site managers, local and regional governments, local communities, NGOs and other interested parties and partners. UNESCO requests to submit the Tentative List using a Tentative List Submission Format, available online in English or French, containing the name of the properties, their geographical location, a brief description of the properties, and justification of its outstanding universal value. Nominations to the World Heritage List will not be considered unless the nominated property has already been included on the State Party’s Tentative List. In conformity with Committee Decision, once inscribed on the World Heritage List, properties are removed from the Tentative Lists of States Parties.

The first demonstrations of rural architecture (re-utilization of traditional buildings and the introduction of modern bamboo architecture) can be achieved within a period of six months according to academic calendars of universities. Since the construction endures only 10-20 days, four months of planning and design is enough time for an accurate preparation before building it real. In this sense Xinhua shall adapt into the academic calendars to satisfy students marks of the semester.

The organization of bamboo plantations, shall adapt into the moon cycles according to when is best to plant, transplant and nursing, regularly is before raining seasons. All information about how to manage moso bamboo is findable in the book “moso bamboo management” attached in the References chapter of this article.

5.3. Why to do it.



People buy why you do it.
Not what you do nor how you do, but why you do it.
Thrive is scalable.

Figure 30: Why, how, what.

5.3.1. Identifying our “why” and following it.

What will make our developing countries successful is not talent, not charisma, and for sure not money. Success is found in the mind, the mind’s why. Often times for a person or society to change their habits, or strengthen their discipline, they must first change their why. For many people, that may be difficult because a person’s “why” is often linked to their core beliefs and values, likes and dislikes.

Sometimes the “why” mindset can be limited by attitude or opinions, such as “is a poor area in lack of money” or “is just to difficult to organize so many people”. Not much will change until there is a shift in the mindset. For example, if you believe that Xinhua is a poor area and lacks of money, the chances of Xinhua becoming rich are slim to impossible. Your “why” won’t even let you try. Before we get to finding our “why”, let’s discuss our ‘why capacity’. We want to understand this so that we can discover the biggest “why” in our developing countries.

5.3.2. As bigger the “why”, bigger the success.

Inversely, the smaller the why the smaller the success, In Xinhua and Sinaloa, the “why” affects the how in two important ways:

1. If we think, “I am not interested in sharing my passion or knowledge with others”, then your limited “why” will reject most “how” to content about many different areas and strategies to develop Xinhua and Sinaloa.
2. We can only be as rich as our “why” allows. For example, a five-litters of water can only hold five litters of water. That’s its capacity. When it comes to money, if we have a \$100,000 RMB “why capacity”, that’s all the money we can hold.
If we want to become a successful community, we need to expand our “why capacity” to achieve it.

By expanding our “why” we increase the capacity to achieve the goal of eradicating poverty by developing tourism and education, thinking global acting local. Most advisers focus on the “how to”; they want to tell us what to do rather than focus on the “why” mindset.

5.3.3. “Why” is mental environment.

When people ask how to eradicate poverty, develop education and rural tourism, even though they are told exactly how to do it, they often won’t do it. This is because the “how to do it” is not as important as the “why to do it”. It is the “why” that give us the power to do the “how”.

The reason most people don't do what they can do is because they don't have a strong enough “why”. Once we find the “why”, it is easy to find your own “how”. Instead of looking inside themselves to find their own “why” for wanting to become rich, most people look for the easy road to wealth. The problem with the easy road is that it usually ends in a dead end. In simple terms, the “why” is often just a mental environment. Change your environment, change your life. Changing or expanding our “why” can also change habitant’s life. It is hard to reach Xinhua’s goals, regardless of “how” much you study and learn if you have a weak spirit or a can’t do it mentality. That is why the “why” is more important than “how”.

If we find our self arguing with a good idea, we may want to stop arguing. We argue because we don't want to feel disappointed again. We argue because we are protecting our self from the pain that dreaming big dreams can bring if that big dream does not become reality.

5.3.4. The Sinaloa and Xinhua’s “why”

Sinaloa’s “why” is simply food security. And Xinhua’s why is poverty eradication. As bigger the problem, simpler the solution. For Sinaloa, is about the introduction of a new bamboo specie in order to take advantage of its high tech agriculture tradition and international logistics already running strongly. And for Xinhua, is about taking advantage of their local resources in order to eradicate poverty in a sustainable way. We envision that for both communities, a new world and a change of paradigm is inevitable. We also envision prosperity and health for population and environment. A new order in geopolitical power. A new understanding of what power is. So many work to do, enjoy the ride.

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