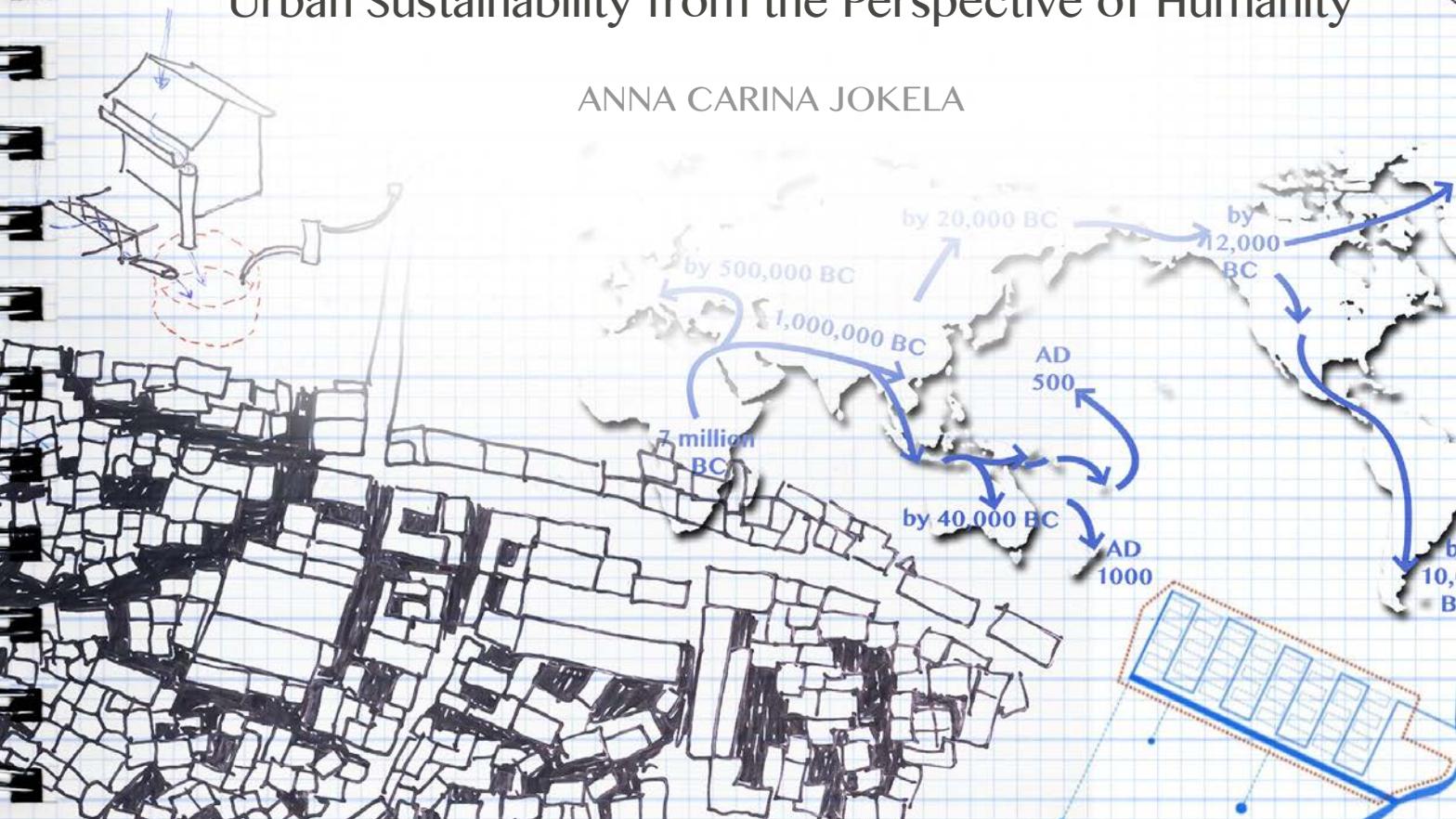


Small-world connection  
with  
Mixed Sustained Specialization

# Seek City Seek Man

## Urban Sustainability from the Perspective of Humanity

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TAMPERE UNIVERSITY OF TECHNOLOGY

# ABSTRACT

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Seek Seek City is a wide-angle long-term view to understand sustainability from the point of Humanity. First, the history of Earth and humanity are briefly recounted, then projecting into the future evolution of humanity, and what problems we face. The main target of humanity is set to be existence and development, that the instability of earth challenges. Then human needs are related to fields and ideas of sustainability. To combine the urban sustainability theories into a holistic view, a concept is created using the Small-world network and 20-80 distribution. The result is an organized network with random connections to other areas and connections to hubs, an that is partially sustainable but also dependent on other areas, and creates services to other areas. Using this principle, an example design is made for four urban environments in China: the metropolis Shanghai, the city Suzhou, the town Pucheng, and the village Xiaomi. The areas are briefly introduced, and based on the analysis as well as the previously found principles, a solution is made on how to improve the sustainability of these areas.

Anna Carina Jokela

SEEK CITY SEEK MAN

Urban Sustainability from the Perspective of Humanity

Tampere 2014

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Työ tarkastelee urbaania kestävyttä ihmiskunnan näkökulmasta. Aluksi kerrataan maailman ja ihmisyyden historia, ja mitä ongelmia meillä on vastassamme. Ihmiskunnan päätavoitteiksi asetetaan olemassaolo ja kehittyminen, jolle maapallon epävakaas asettaa haasteita. Sen jälkeen ihmistarpeita verrataan kestävä kehityksen periaatteisiin, joka helpottaa priorisointia suunnittelussa. Teos esittelee "pieni maailma" verkostoa sekä 20-80 jakaantumisen periaatetta, joita käytetään kestävien mallien yhdistämiseksi kokonaisuudeksi. Tuloksena on järjestäytynyt verkosto, jossa on satunnais-yhteyksiä ja yhteyksiä isompiin keskuksiin, ja jossa jokainen alue on osittain omavarainen mutta osittain riippuvainen muista, sekä palvelee muita alueita. Tämän periaatteen pohjalta suunnitellaan neljä kiinalaista urbaania aluetta kestäväällä tavalla: Metropoli Shanghai, Kaupunki Suzhou, Kaupunki Pucheng sekä kylä Xiaomi. Alueet esitellään, ja analyysin sekä edellään mainitun periaatteen avulla esitetään kestäviä suunnitelmia alueen kehittämiseen.



# PREFACE

I have often felt lost in the world of sustainable design - so much talk about green solutions and holistic views, that I have had no idea what is really important in any specific case.

Living in China, I saw the huge need for more sustainable urban solutions, and the enthusiasm in Architectural companies to plan them, but nobody really knew what they were!

I started my quest, seeking the answer to the question "What's Urban Sustainability got to do with us people?", as well as "How could we use it?"

Searching for material on sustainability, the main problem was the quantity of material. Almost anything and everything has this s-word, and if it did, I read it – for three years.

I started by researching sustainable architecture, ranging from zero-energy buildings to long-term livability, then continued to sustainable infrastructure that provides with potable water, food production, energy, goods manufacturing, garbage and material recycling. Next I considered environmental issues such as the water cycle, plant and animal ecosystems and cycles, and soil remediation. As I became more interested in how we have managed this before, and what is important, I continued to read on anthropology on the rise of human societies and development, psychology and the changes in the human brain and behavior, as well as natural synchronization and networks. I looked into the history of economy and its current state, as well as its cycles and the target for a sustainable economy. I

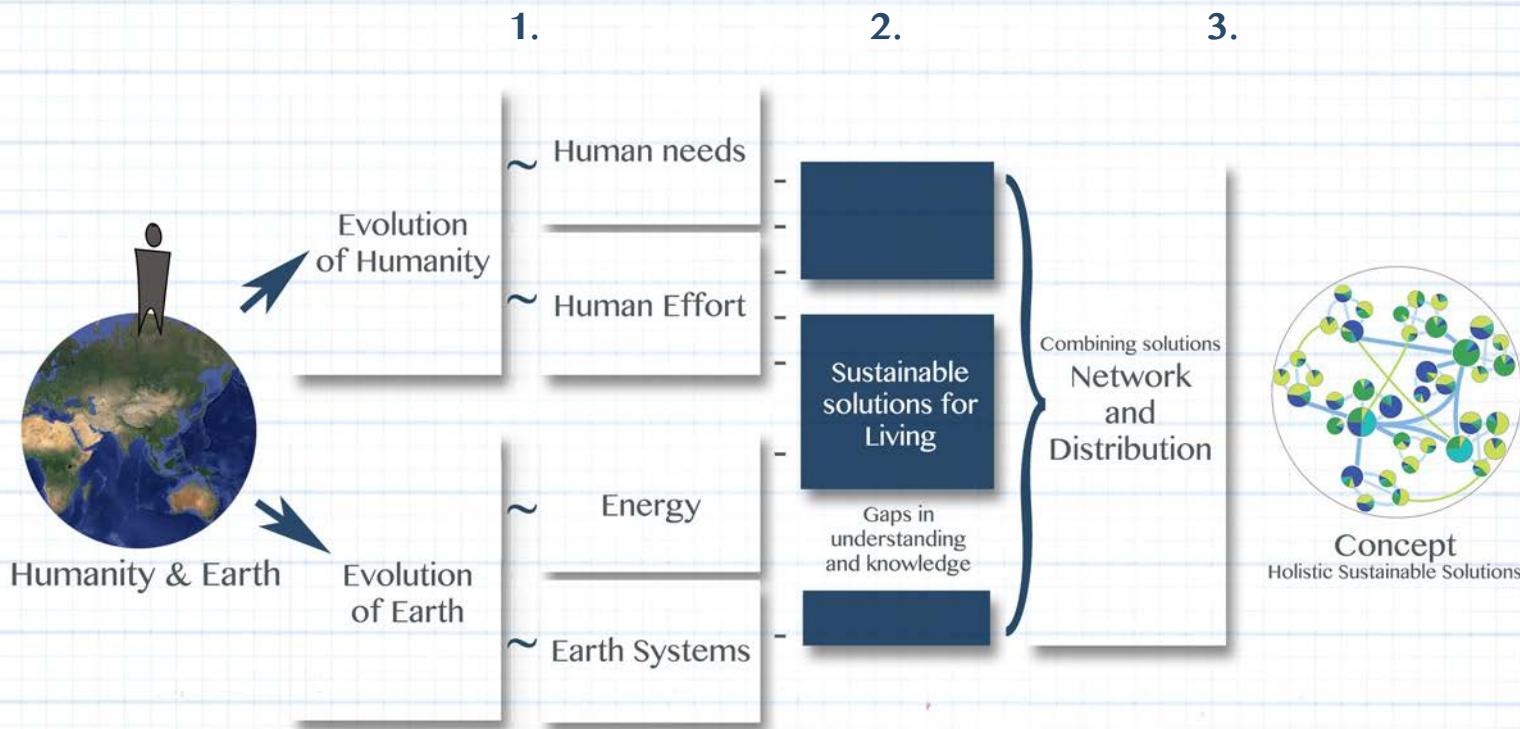
studied the history of our planet and universe, and the constant changes our planet is going through. At last, I looked into all weird technological and infrastructural innovations using the "sustainability" word.

When deciding to make the case examples on China, I travelled more to various types and sizes of urban settings, also towns and villages, asking the people there life stories and how they saw the limitations of their environments. Studying architecture in Tongji, in projects we often had the opportunity to interview inhabitants in old and new residential areas – many of which were Shanghainese, some of which were migrant workers.

My work experiences have been useful: in various projects in Milan LAND srl urban development, especially regarding cultural heritage revitalization and ground remediation. I gained insight to Chinese design methods and urban planning problems in the Shanghai architecture and design company Xiandai Design Group – and also got to be on the Chinese side of international negotiations.

Talks with urban designers and architects working in China or doing projects in China, eg. PES architects, Guy Walter, JKMM, RT Architects Shanghai, Metrogramma, Park Associati, Standard Architecture Shanghai, were also invaluable to grasp the huge difference of thinking in Western countries and Asia, and what viewpoint is still missing.

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# INTRODUCTION

Urbanization has exploded: more and people move to cities, as they can provide what rural areas can't. But can cities sustain this pressure? The arising problems in resource management and urban space quality have lifted sustainability from a marginal concept to an ideology sought for in almost all sectors of industry. It is taught, applied into technology and design, and marketed in products.

The goal of sustainability still seems unclear. It has been defined in various ways, an early definition by the United Nations is "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland commission, 1987) .

Planning human environment has shattered into hundreds of fields and professions. The idea of sustainable development has led to heated discussions of optimal urban density, is our oil running out and when will it happen, what causes global warming and what can we do about it - inventors are thinking of ways to pour gas into the stratosphere in order to cool down the earth. Should we recycle plastic bottles? Farm locally or intensively? How should architecture, politics, industry, science and lifestyle adapt? With all the details, it's hard to see the big picture.

Our goal could be to sustain the current situation, rise the overall living standards, or reach maximum material wealth. I agree with all these values, but they are still too narrow and none-universal.

If we look at the goal of other life forms, for example an amoeba or fox – it is to continue existing as a race, as well as adapt to changes and develop as a race; In short, to exist and develop. Organic life forms have various tactics for this – from the humble "keep it simple, highly adaptable and long-term" of lichen, to the more complex and development-oriented goals of mammals.

How can we sustain and develop humanity with urban space? What is the relation of sustainable ideas and humanity, and what aspects are we missing?

Seeking the answer, this thesis zooms out both in time and space, in order to understand our direction, needs, and critical points. Then existing sustainable ideas and concepts are listed, a holistic planning concept is created using the natural small-world network and 80-20 distribution theory. As a case example, I use these principles to plan four living blocks in China: a metropolis, a city, a town and a village.



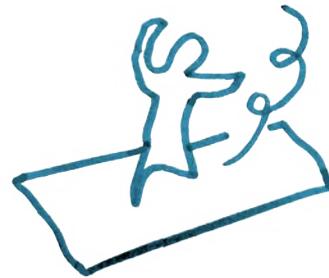
*3D Map of Shanghai Hongkou district (Baidu maps)  
Photos of Shanghai Mass transit system: bus and metro*

# EARTH AND HUMANITY

## Humans

Do activities in places

1. Sustain



2. Develop



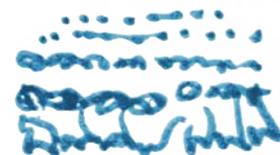
1. Alone



2. in Groups



3. in Societies



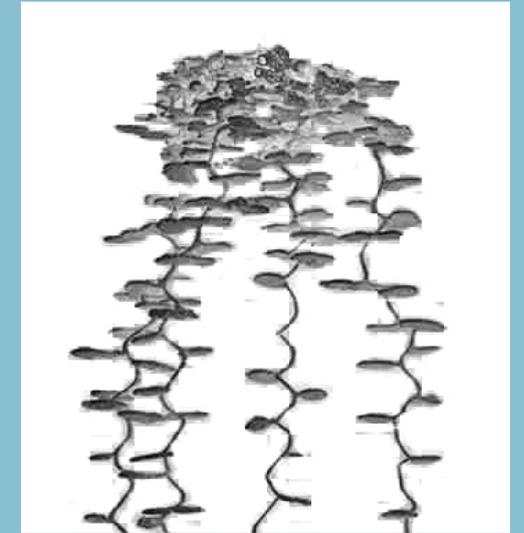
The biomass of ants is estimated to be similar to the biomass of the human race.

(E.O. Wilson)

Ants have a clear division of labor, efficient communication using pheromones, sound and touch, and an ability to solve complex problems as an entity. They form giant underground structures, come to the aid of those hurt and advise each other for the best path for food foraging.

Humans have studied ants to gain more insights and answers in medicine, social systems and evolution.

*Subterranean ant nest*



Ants seem simple, but can manage and maintain a huge quantity of individuals, adapting to changes in the environment. What about us humans? In order to get a clear idea, let's lay out the basics, about our planet and us humans.

Future studies Linda Groff's division of humans as a product of four broad stages of evolution:

1. The physical-chemical-geological universe and earth
2. The biological evolution of species, e.g. instincts, drives, body processes
3. The cultural evolution of socially-learned behavior, technology and tools, social organizations, values and beliefs
4. The Consciousness, the ability to wake up and become conscious of the areas of developing, using intuition and creativity to develop in new ways (Groff, 2005).

Here a similar approach is used: I first discuss the planet and its evolution, then humans and their evolution, dividing human needs into biological needs and cultural and social needs.

# Earth

Our whole universe is in constant motion, as it expands and materia because more and more dispersed. Stars die, and supernovae create new ones. Our sun, too, is expanding, and it has hotter and less hot years.

Our planet started when the solar system materialized. It has since gone through a lot - though the earth seems a stable place to us, it is actually not. (Bill Bryson, 2003)

The earth has gone through several Ice ages, because of the changing size of its rotation around the sun. At some point, there were crocodiles in Antarctica! An ice age creates nutrients to the soil, the pressure creates oil and natural gas. Now we are at the end of the warm period of an ice age - this might mean that a colder period is next. The carbon content of the atmosphere is in constant change too - it has been high before, as well, and this resulted in major changes that killed plants and trees. Last time, the carbon cycle reasserted itself in 60 000 years.

The continents and the entire sea beds are in constant motion, causing earthquakes and volcanoes to erupt. Even now, the super volcano of Yellowstone is due to erupt - it is actually already late 30 000 years, when 600 000 is its average period between eruptions. Earth's magnetic field changes a lot, it was almost three times stronger in the period of dinosaurs. The atmosphere shields the planet from the hot sun, and slows down rain drops so that they do not arrive at to great speeds to the ground. There is a lot of energy on the planet, too - a single thunderstorm has enough energy for the whole United

States for four days. Though the conditions on Earth seem stable, this is largely because the gravitational pull of the moon keeps the speed and angle steady, so that sustainable life can develop. (Bill Bryson, 2003)

Biological life emerged, first as simple-celled organisms in primordial soup, then in water and on land. New species have evolved and mass-extinctions, e.g. of dinosaurs, have regularly taken place. At the moment, species are disappearing at an increasing rate. Often complex life forms die off faster. Some believe we are now in the sixth mass extinction of species on this planet, the fifth mass extinction being the extinction of the dinosaurs 65 million years ago (Groff, 2005).

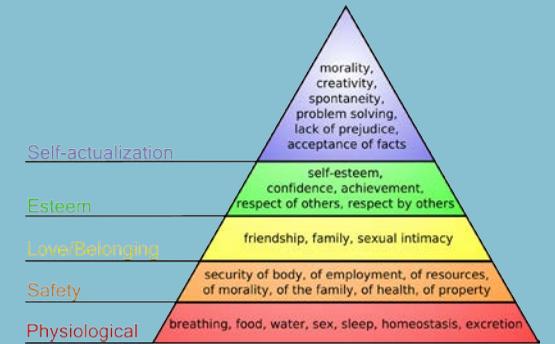
# Humans

Points of life:

1. Wants to be
2. Not want to be too much
3. From time to time goes extinct

- Bill Bryson, Science Author

Maslow, in his Maslow's Hierarchy of Needs, (Maslow,1943) divided the human needs according to the priority as well as importance – higher needs are seen as more advanced. Basic bodily needs come first, then safety, then more complex social needs.



If we take the viewpoint of humanity, we should also consider why it exists. Why does life exist in general? Life wants to exist and develop.

Okay, what does existing and developing require for people? We have to fill needs of the body and the mind, and we do it alone and in social groups. In urban design, we should have spaces that allow for these needs to be met, and for us to do the activities required.

Many attempts for getting an idea of human needs have been made. Here to simplify, I divide them into two parts.

## 1. Basic needs

Basic needs are the physiological and simple physical needs of humans, most of which even an amoeba has

## 2. Advanced needs.

Advanced needs are more familiar to animals and people, mostly they are social needs. Advanced needs drive us to communicate and develop. These lists are hardly exhaustive, but give us a basic idea.

These needs are true as long as we are what we are now. As species develop all the time, we too might evolve into something else, or use technology to change ourselves. Posthumanism is an idea that believes humans could use technology to enhance our cognition and bodily functions, thus expanding our abilities. (Hopkins, 2012) Also our mind might elevate to a next level, where bodies are no longer needed (Carmody & Carmody, 1996)

## Basic Needs

### BREATHE

Enough oxygen for body: not too much CO<sub>2</sub>, not too many harmful particles, pollution or chemicals. The air pressure is suitable.

### EAT

Nutritious: diverse enough to contain protein, fat, vitamins, minerals etc.

Has enough calories. Is clean, safe, not harmful amounts of chemicals, hormones, toxins or carcinogens.

### DRINK

Hydration. There is potable water available, it is clean, safe, does not contain harmful amounts of chemicals, hormones, minerals, toxins or carcinogens. It can also be potable juices from plants

### SLEEP

An safe are with suitable temperature, area with safety, suitable temperature, suitable surface, and is quiet enough and dark enough.

### TEMPERATURE

Maintain body temperature; not too cold or hot, too dry or moist, not too much air movement such as wind or draft.

### HYGIENE

Clean enough with not too many bacteria or virus to become sick or cause dysfunctions in skin, metabolism etc. bodily functions. The person and the immediate living area must both be clean enough.

### SAFETY

Safe from animals, insects and people.

A feeling of safety is needed, caused by other humans, familiarity and visibility.

### SEX as REPRODUCTION

Sex is a strong needing healthy bodies capable for reproduction. (See advanced needs: sex as a social activity)

### EXERCISE

Physical moving to keep the body and mind functioning normally, for example the metabolism.

### PRIVACY & SPACE

Own space to care for own hygiene. Too dense living or little space causes stress - this depends on user, though.

### MOVEMENT

Can move alone or in groups, in a large enough area that it seems they have freedom of movement. There is also the need to sometimes go "far away"

### CHILDCARE - basic needs

There is the need to care for the bodily needs of the children, feed them and let them sleep. (See advanced needs: CHILDCARE - advanced needs)

### HEALTH CARE

Not getting sick, as well as getting better when sick, and alleviated pain.

### BASIC KNOWLEDGE

Information crucial for living but more complex than instincts, for example what is edible and what is dangerous.

## Advanced Needs

### SOCIAL RELATIONS

Relatives, marriage partner, friends

### COMFORT

More comfortable environment, easier and less tiring ways of

### ORGANIZATION

Governing of group, being lead or leading, deciding in groups, etc.

### ENTERTAINMENT

Entertainment alone and in groups, fun, sex, play, stimuli for the brain

### COMMUNICATION

Speech, books, videos, hand signs. There is a need to communicate with others.

### INFORMATION CREATION

The need to understand. Get help from people, learn, hear stories and experiences, learn by doing

### INFORMATION STORAGE

Storing it as books, songs or notes.

### INFORMATION MANAGEMENT

Sort information with notes, piles, libraries

### INFORMATION SHARING

Sharing information by discussions and stories, TV and media, cooperation

### SELF-EXPRESSION

Express feelings of anger, sadness, fear, sexual desire, happiness and relaxation.

### BEAUTY and ART

Aesthetics and art, a way of expressing feelings and sharing information

### EDUCATION

Teaching and learning

### GROUPING

Belong to larger entities: Family, group, community, society

### SELF-ESTEEM

Status and appreciation inside the social hierarchy

### RELAX + HAPPY FEELING

Having "happy" hormones in brain: endorphin, serotonin or dopamine. These can be caused by filling any basic or advanced needs; for example by eating, doing sports, succeeding, receiving appreciation or love.

### CHILDCARE - advanced needs

Teach children, learn from them, care for the advanced needs of children

### INDEPENDENCE

Ability to take care of self

### DEPENDENCE

Be taken care of and loved

### SELF-ACTUALIZATION

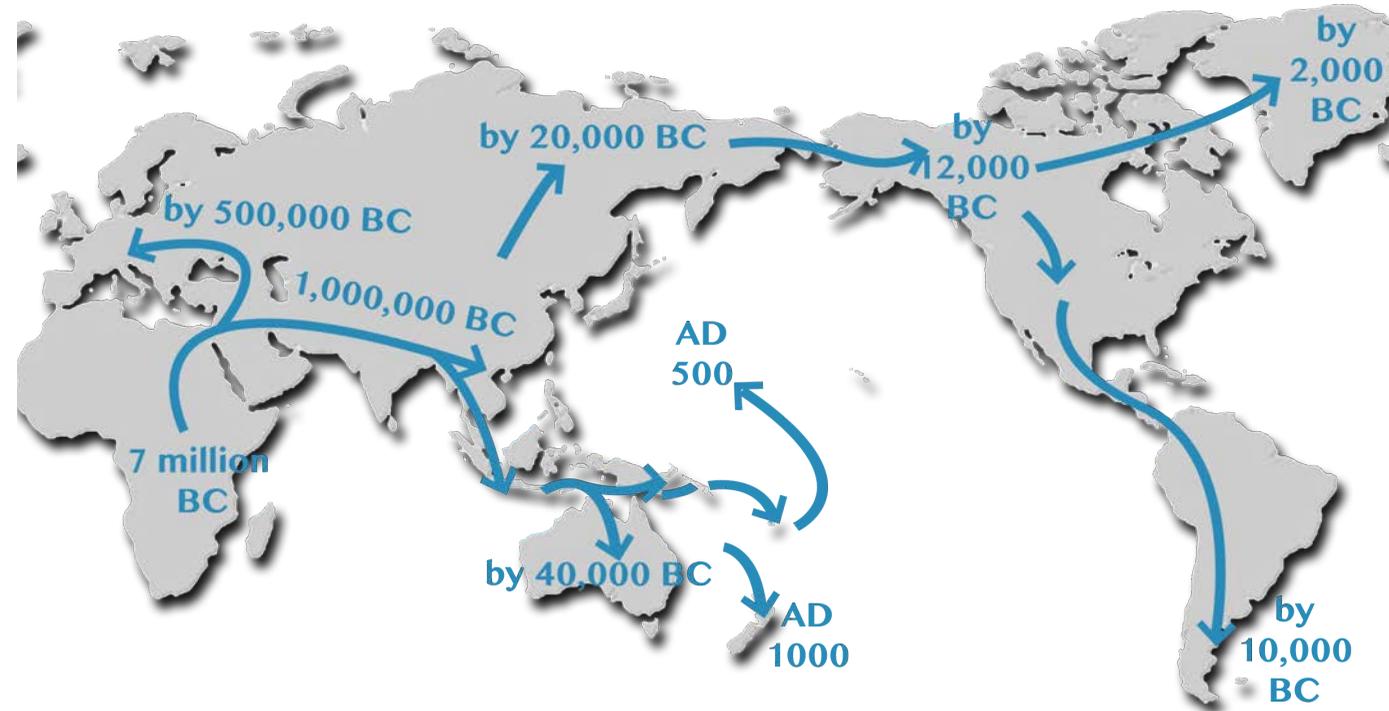
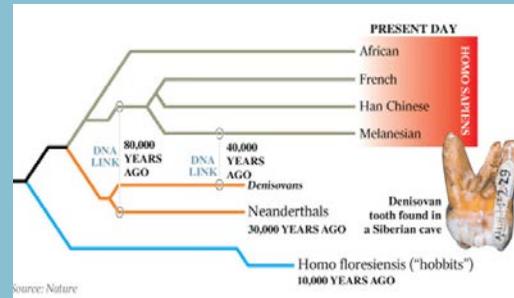
Can develop self and surrounding, care for others, such as children, friends, and pets.

# Evolution of Humanity

According to digging and found human bones, people have originated from somewhere in Africa. Africans have not always been all black - originally, there were various peoples in Africa, from pygmies to black and brown-skinned people.

They migrated into the world in various waves, the earliest is shown below, starting from the fertile Crescent area. Later, more waves of peoples from the Middle east, Europe and Asia migrated to places around the globe, resulting in conflicts with Native Americans, Original Indonesians, Australian Aborigines, as well as with each other.

*Development of human race (Nature)  
Migration of Modern man (Diamond)*



Jared Diamond is an anthropologist that became interested in why some societies dominate others – why did Europeans dominate over Native Americans? Why did the Chinese settle most of the Asian islands, instead of the original people that resembled Australian aborigines? This resulted in information in how humanity has developed, what is its direction, and how societies rise and fall.

Humans have gone through the agricultural, industrial, and information ages (Toffler, 1980). Each subsequent age has occurred much more rapidly than the previous ages. What has created this development, then?

Diamond mentions five main points:

- Suitability of area
- Connectivity
- Efficiency of food production and distribution
- Society and Social system
- Diseases

We can also add some, that he sees are related to connectivity

- Economy
- Technology
- Information
- Transportation

Groff and Goleman have mentioned one more

- Psychological, or Consciousness

## Suitability of area

Areas that have had plants and animals suitable for farming, such as wild oats, wheat, chickens, goats, have had a much easier time transitioning into agriculture. In Africa and America, most of the farm animals were imported later. The same goes for areas that then later had iron ore available and could create more weapons and tools.

## Connectivity

Asia, Europe and Middle east have had a huge benefit of their location. People, new crops and ideas flowing in a horizontal direction is also much effort-less than in vertical continents, such as Africa and America, where mountains and climate differences have impeded the sharing of benefits. Better connectivity has also led to more wars, and the necessity of being better prepared. By trading, technologies have become more advanced, and after writing developed it greatly sped up change in society.

## Efficient Food Production

Being able to provide for more people more efficiently has allowed for greater density and specialization, and thus more time to invent, especially in areas that are not bountiful enough for hunter-gatherer lifestyle.

## Society

The human species is naturally gregarious, as opposed to being solitary, and forms groups in various levels and sizes.

The most primal groups of people were bands of families, that later developed into tribes. Tribes became kingdoms, then more complex feudalism with elite, leading to current government.

More density leads to a greater imbalance in distribution of power and wealth, creates more rigid hierarchies, and creates many problems such as sickness and poverty to the masses. What keeps us together, than? Diamond identifies several “social glues” that keep societies intact, and if they fail, the group, kingdom or nation becomes separate again - this also being very common for human societies.

Society glues:

- A religion, an ideology or common values
- personal motivation and reason for life, keeps groups working for a united goal, bonds people
- A clear decision maker and leader, elite or governing element.
- This elite provides safety and benefits to the masses, by example disarming the populace, arming the elite, having rules on not harming people and enforcing these rules.
- The tribute and tax paid by populace is partially used on providing for the needs of the populace

## Diseases

Agricultural societies have always had more diseases for two reasons: one is the density of population,

but the more important is the proximity of animals. Many of our diseases are originally from cats, pigs or birds.

## Economy

Economy also plays an important part of development. In every developmental leap, a new currency revolution has taken place: from trade to skins, coins to paper, then loans, companies and investment, instruments, futures. Now, money is already separate from the factual gold or silver: only 1/10 of the money exists as actual gold in bank treasuries.

All these methods have, at their own time, allowed for more efficient resources to flow to where they are needed, as well as made social welfare possible. As the financial world evolves, some methods are flops and create crisis - such as sub-prime loans in the US in 2008. Crises happen repeatedly and strike worst for people without memory of the last one – this is about every 25 years. Some call this the “Darwinian process of Economy” - working solutions stay, and bad ones create a crisis and disappear. (Ferguson, 2008)

## Technology

There are various aspects that have resulted in technical advancements. Often, useful findings are first used for fun, like wheels were invented in Mexico for toys. Having rivalries also speeds up the process, such as Marsh and Cope, two paleontologists that then found many new bones while competing for fame. Many important discoveries start, when someone else asks a question - Halley had asked

Newton once, did he think it was possible to calculate the curve of planets rotating around the sun. He spent the next two years on giving the answer. Entertainment and diverse fields help to have ideas: Mendeleev created his theory of genes and inheritance by organizing information like in a game of solitaire. Often similar ideas arise simultaneously, like with the airplane, electricity, and theory of evolution. (Bill Bryson, 2003) This means ideas are not discovered by an individual person, but by vibrant societies. Advancing slows down most by lost and forgotten information and skills, for example in the middle ages.

## Information

Before, people shared information by telling stories and singing, later proceeding to writing. The media of today together with the internet and mobile devices have created incredible changes: Information creation is easier than ever before. This has led to new needs for managing information, the notion of “Big Data” management. Storing is also an issue, requiring technological advancements, as well as finding, sharing and consuming the correct pieces of information.

## Transportation

From walking and horses to driving and flying on airplanes, people are more mobile than ever before, with increasing amount of people traveling for business and leisure. The elusive “teleportation” is still waited to be invented, though.

## Psychological

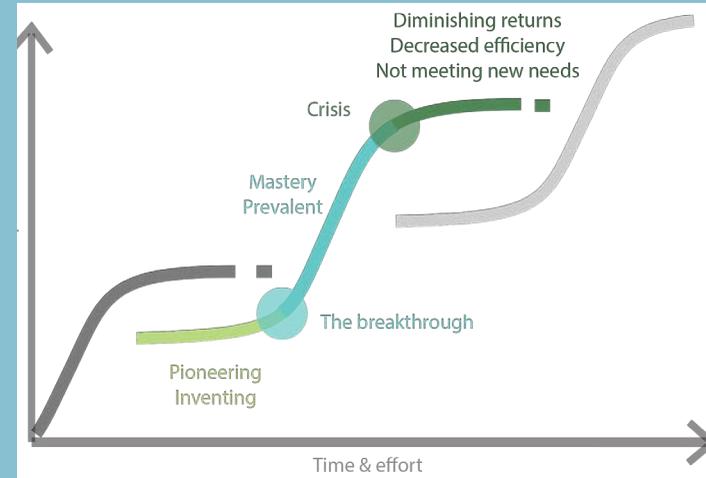
We are much more advanced psychologically than what we were in the days of Vikings, let alone Stone Age. A good example of this is seen in child care: before, children were just seen as small adults, that can be hit when they behave badly. Now, we recognize that their brain is totally different than the adult brain, with functions that are good for learning and developing new skills. This has totally changed the way we raise our children, and thus made the new generations of adults even more capable. Though people are still largely impulsive and often affected by their instincts, we are becoming more and more conscious and aware of our existence and possibilities. (Goleman, 2006)

# Implications

## Diffusion of innovations –theory

This transition theory shows the diffusion process of how an innovation spreads among consumers. Innovations are first used in small groups, then a breakthrough happens. As the idea matures they spread even more, in the end becoming prevalent. At some point the method is no longer enough to meet the needs. From the many innovations in the invention phase, one has a breakthrough and becomes prevalent. The old method is outdated.

This model, also known as the S-curve theory, has since been applied to many transitional aspects: ideologies, technologies, personal learning, phases of humanity, adoption of a product, etc. As an example, LP records gave way to CD discs, now music are in files in iTunes or a cloud service.



Humans are not very adaptable. We can only live on land, breathe air, cannot stand pressure in deep seas, can't take cold or hot climates. Bacteria, on the other hand, can even live in the pipes of nuclear reactors, eating on nuclear waste. How can we become more flexible? Create systems and technologies that help survive through hot and cold? How will ants do it?

We have always had the need to spread out and explore, as well as form denser, more complex populations.

Small tribes and groups are sustainable, but not developing. It is still important to keep both models. Diversification and mixing of ideas is crucial. We need communication, information exchange and co-operation. Even bacteria communicate, by sharing parts of their genetic information.

Requirements for better connectivity:

**Time:** Fill our basic needs more efficiently, by example intensive food production

**Transportation:** Objects need to flow and people need to meet

**Density:** more meetings and discussion

**Communication Technology:** connecting digitally, across time and space

**Ability to communicate:** Language skills, basic education, ability to understand new topics

Better connectivity and density also creates issues: "Now a globally-interdependent world is forming, with various races, cultures, religions seeking balance despite the diversity" (Groff 2005). Growing density has resulted in scarcer resources, thus we are facing resource wars on oil, water and arable land (Danai Krokou, 2014).

We need better social glues to continue living peacefully in a world where some areas become even more dense and the population becomes more diversified. Hierarchy and equality gaps must be planned and managed, not prevented.

Economic ups and downs are frequent, and economic crisis should be seen as a part of normal financial development.

A variety of different societies needs to exist: small individual groups as well as highly sophisticated metropolises. Small groups should strive for higher individuality, as they are a good way to test new systems and methods for creating and using energy and food, as well as recycling waste and water.

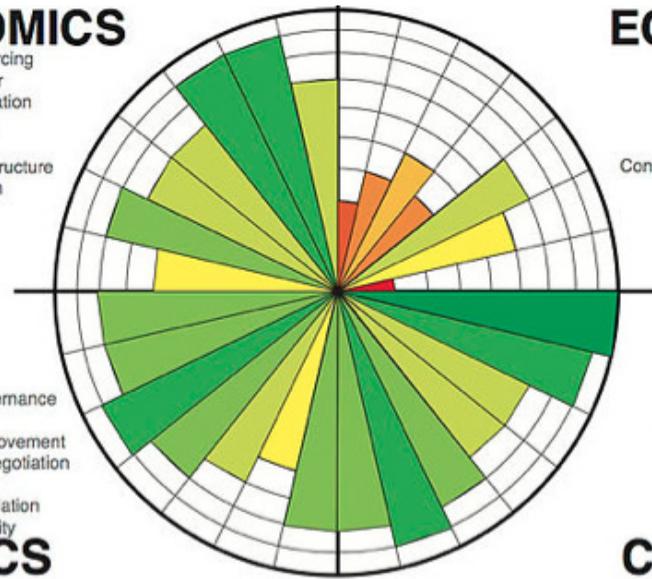
Dense cities should make full use of the wide array of various professionals, readiness of information, and closeness of equipment and facilities, by High-technology development. At the same time, the social needs of privacy, safety and familiarity should be addressed in a more rigorous fashion.

Changes and transitions always cause disruptions and crisis. Crisis is the evolutionary driver of change! They force development by making people deal with problems and understand larger systems, as well as local needs (Groff, 2007)

# URBAN SUSTAINABILITY

## ECONOMICS

Production & Resourcing  
Exchange & Transfer  
Accounting & Regulation  
Consumption & Use  
Labour & Welfare  
Technology & Infrastructure  
Wealth & Distribution



## ECOLOGY

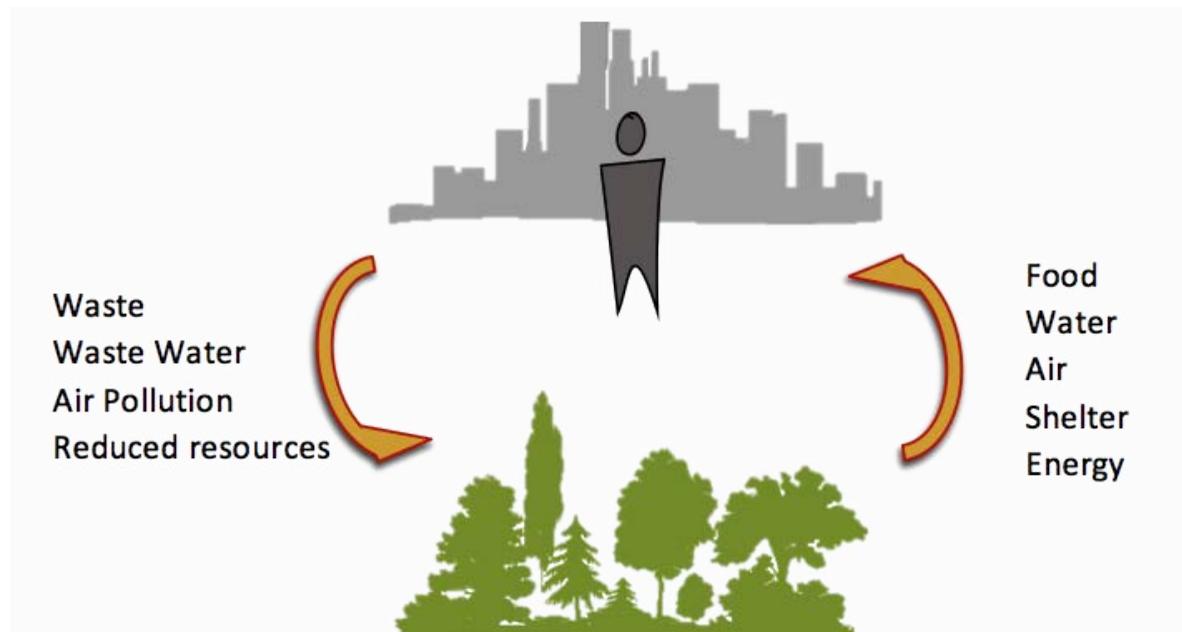
Materials & Energy  
Water & Air  
Flora & Fauna  
Habitat & Food  
Place & Space  
Constructions & Settlements  
Emission & Waste

Organization & Governance  
Law & Justice  
Communication & Movement  
Representation & Negotiation  
Security & Accord  
Dialogue & Reconciliation  
Ethics & Accountability

## POLITICS

Engagement & Identity  
Recreation & Creativity  
Memory & Projection  
Belief & Meaning  
Gender & Generations  
Enquiry & Learning  
Health & Wellbeing

## CULTURE



## Ideology of Sustainable Cities

The field of sustainable concepts, products and practices is so extensive, because almost all of the aspects in our lives can be considered in the view of sustainability.

There are many sustainability rating systems, such as LEED, BREEAM, CEEQUAL, which have also been as a basis. What is the sustainable view, and how does it relate to the need of humanity: to exist and develop, and fill our needs?

A common way is dividing sustainable areas into Economy, Society and Environment, originally mentioned in The Brundtland report 1987. The UN has defined Circles of sustainability as Ecology, Economics, Cultures and Politics. The Ecology has also be defined more detailed as Ecosystem services, dividing it such:

Ecosystem services:

- Provisioning: the production of food and water
  - Regulating: control of climate and disease
  - Supporting: nutrient cycles and crop pollination
  - Cultural: spiritual and recreational benefits
- (United nations, 2005 Millenium Ecosystem Assessment)

WHO sees a healthy city as safe and clean city, that provides health care. and a community that can involve in local government. It promotes it's his-

tory and culture and has a diverse economy. What comes to ecology, it must rest on a sustainable ecosystem. (WHO 1996)

Len J Duhl (Duhl, 2000) has a similar list, adding aspects such as common values, complex interactive economy, decentralized power, leadership that focuses on whole city, and adaptability to change. Crucial is also to support and maintain infrastructures.

There exist global values, too, that are related to human needs. These commonly agreed upon principles include: peace and nonviolence to solve problems; social justice; eliminating poverty; providing educational and job opportunities for all people; taking care of the ecological system; and finding inner peace. (Groff, 2002)

Defining "sustainable ecology" or "sustainable urbanization" is especially hard, because we don't understand how biospheres work. With theories in hydrological cycle, carbon cycle and nitrogen cycle, we are starting to have an idea, but it is still very far. It is very hard to anticipate all the complex interactions that can occur - attempts to replicate the biosphere have not succeeded (Allen, 1991).

# Sustainability Techniques

Here I divide sustainable practices in relation to the human – basic needs, advanced need, and then add time and effort – which is work done by humans - and energy – work done by electricity. This is to show how sustainability relates with human needs, as well as see contradicting methods in perspective.

## 1. Basic needs

Ecology services and the parts of environment that help us meet our basic human needs, similar to those of animals, such as water, food, warmth and shelter, and basic mental needs such as safety.

## 2. Advanced needs

These are all the social activities that organize our efforts to fill our basic and advanced needs efficiently, as well as develop. This includes education, politics, entertainment, culture etc.

## 3. Time and effort

Economy is sometimes simply seen as “money”, when in the broader perspective, it is time and effort. Everything runs on an economy, be it a trading economy of Australian aboriginals, a NGO, or our modern Wall-street stock-market exchange. Every time you lift your hand to do something, it is a part of the economy, it is investment of your time and effort – be it in playing the guitar, selling your old skateboard, or putting up a recruitment notification for your company.

## 4. Energy

What is energy? We could see energy as an ecosystem service, but it is not directly a part of the needs. Created electricity is a way to store and transport energy from one energy types into whatever energy type is needed. As our skills of creating and handling energy increase, it is becoming a commodity or form of trade, almost like a new form of currency.

## Basic Needs

BREATHE

**Urban greening with vegetation:** plants absorb CO2 and purify air

**Vertical farms:** hydroponic plants in buildings in urban areas

**Manufacturing emissions:** Technologies for filtering smoke

**Construction pollution:** More restricted or different construction methods

**Traffic emissions:** see “movement”

**Antipollution policies**

EAT

**Localization of food production:** Gardening trees, crops and mushrooms, insect, fish and chicken. Pond systems with fish and aquatic plants

**Outsourcing of food production:** Logistics and packaging costs are less than costs of farming inefficiently or in polluted, unhealthy areas

“Last mile” of food delivery: Possible to shop by foot or by bike

**Permaculture & Polyculture:** Farming various plants, fish and insects in a way that they support each other and provide nutrients. Chemical repellants or nutrients are not necessary.

**Vertical farms:** hydroponic plants in buildings in urban areas, also possible for fisheries

**Quality soil by Remediation:** wetlands or plants that biologically remove contaminants from soil

**Reduce amount of wasted food:** Better packaging, food treatment

**Clean: No antibiotics for livestock**

**Use natural plant-bases insecticides**

Produce food in a place where it doesn't need lots of artificial light/heat/pesticides, or the energy needed I green energy

**Eat foods with low-energy production,** e.g. chicken, pork, game, natural fish.

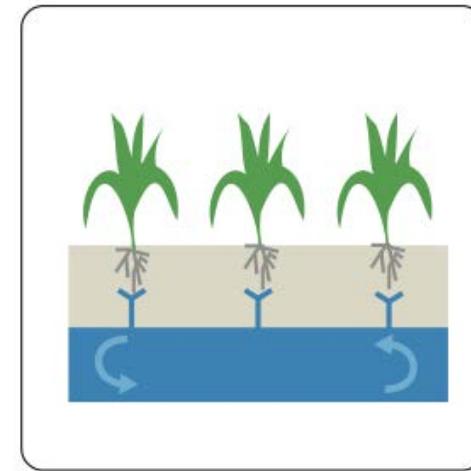
**Drought resistant crops**

**Local growing:** Hydroponic and Aeroponic solutions for low-maintenance crops

**Not using environment –harming toxins**

**Not cutting down trees that prevent desertification**

## Hydroponic Farming



- an Albert/ Weber Thompson (www.weberthompson.com)
1. Rain water collection
  2. Cistern
  3. Purification
  4. Potable water
  5. Grey/black water
  6. On-site wastewater treatment
  7. Output water to wetland system
  8. Rain water for urban farm
  9. On-site infiltration
  10. Nutrient supply for growing systems
  11. Hydroponic, aeroponic growing facility



## DRINK

**Manage hydrological cycle:** enough absorbent area in urban areas, e.g. amenity greenspaces, semi-natural greenspaces, parks and gardens, outdoor sports facilities, green roofs

**Encourage hydrological cycle by de-paving driveways,** using crushed stone and granite or paver stones

**Avoid toxic runoffs:** Sustainable urban drainage system SUDS for storm water management

**Rainwater collection:** Collect from roofs and trenches

**Water recycling:** collect rainwater, treat greywater and blackwater for reuse, eg. gardening and toilet flushing

**Treatment of greywater locally:** in wetlands, “Living machine” treatment using a system of tubs; use UV in sunlight; floating islands in ponds; using filters and cloths; using biological systems

**Constructed wetlands for water treatment:** Not for areas where soil is too permeable or not permeable enough, climate is too cold or too hot. Wetland types: free surface flow, subsurface horizontal flow, vertical flow. Ponds, lakes. It is important to keep the water moving – if the flow is too slow, the water may start to smell and attract mosquitoes. There are solutions, eg. the rotating solar bee that runs on sunlight.

**Xeriscaping:** Using plants native to the area to reduce need for watering

**No pollution near water sources**

**Use dry toilets or urine-source separation toilets**

**Desalination technologies**

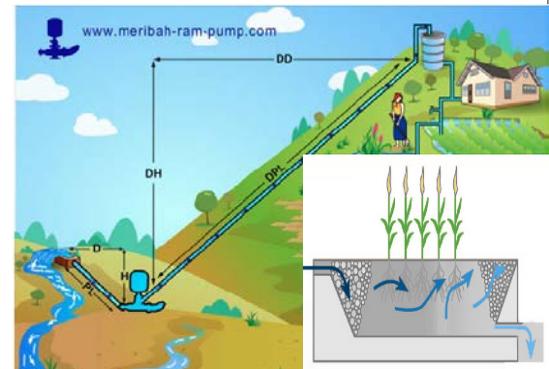
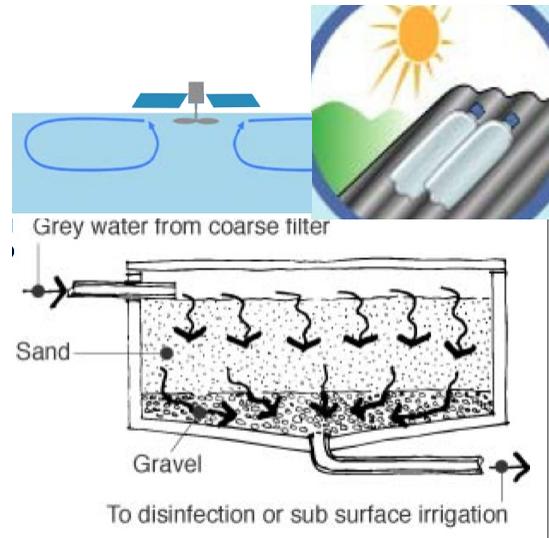
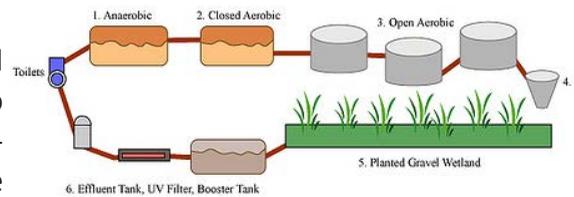
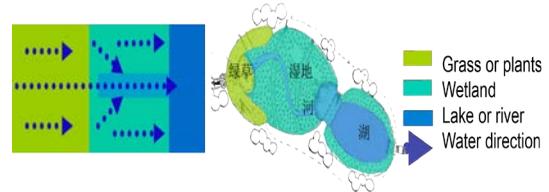
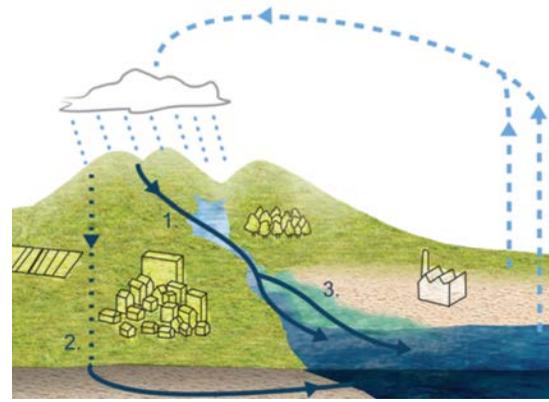
**Often Municipal water not clean:** has fuel remnants, chlorine, pesticide remnants. Recommended to have local mini-treatment systems

**Avoid Eutrophication:** can be reversed by pumping oxygen in the water; manage agriculture runoffs

**Man-made spring water:** pouring water into the ground for physical and biological cleaning naturally

**Centralized High-tech treatment according to local water type:** grit removal, biological treatment, chemical addition, filtration via membrane bioreactor (MBR) and ultrafiltration (UF) membrane systems, and disinfection via ultraviolet (UV) and chlorination.

**Water efficiency:** reduce leakage, increase reuse, staggered water-price tariffs to decrease better-off people using huge amount of water. Use ram pumps to move water in poor areas



## TEMPERATURE & SLEEP

**Natural ventilation:** shaded arcade, courtyard form aids with cooling the house, ventilation windows, ventilation shafts

**Cooling in hot climates:** thick brick walls or wood and small windows. Concrete and big windows are not suitable.

**Extra insulation for cold or hot:** Balconies with glass windows work as a buffer zone, especially when fixing old buildings. Also other buffer zones can be used, eg. plants or a structure.

**Enhance the opportunities offered by topographies** and natural settings and use of the buildings' envelope to filter temperature, humidity, light, wind and noise.

## HYGIENE

**Easily cleanable materials**

**Waste prevention:** reduce, re-use, recycling, energy recovery, disposal, compost, upcycle, reduce packaging or use bio-degradable packaging

**Waste sorting:** organics, paper, garbage, plastics, glasses, steel and aluminum, milk cartons and tetra packs.

**Integrated underground recycling system**

Incineration of waste to create energy: Fuel cell technology

**Composting bio waste:** 2-parted compost, a compost must sit 2 years until it can be used.

**Breaking down plastics:** Mealworm, worms that eat plastic

**Control global nitrogen cycle and nutrient flows**

**Reuse of construction waste** and factory assembly waste, or processing and selling it

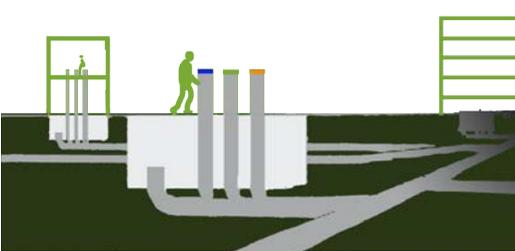
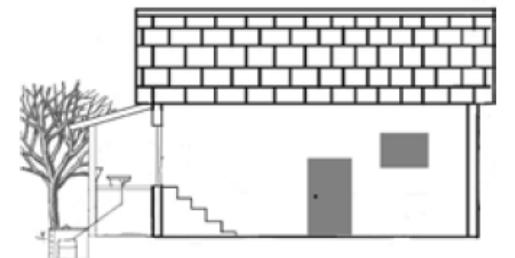
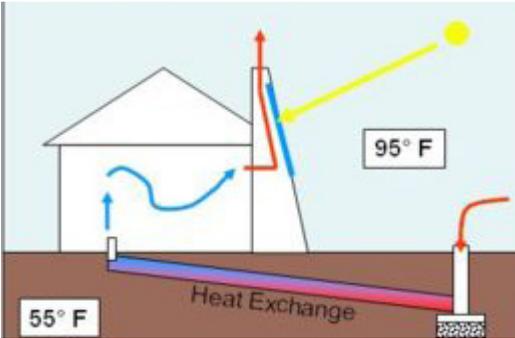
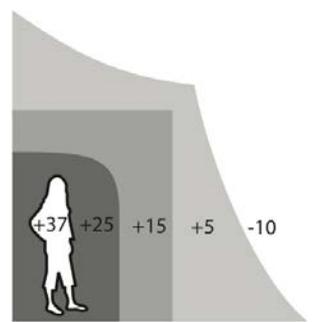
**Reuse materials:** Wood beams, flooring, metal beams, windows, plumbing, sinks, cabinets, toilets. Crush concrete and use for aggregate in new concrete or in road base. Brick waste for paving base and landscaping

**Applying pre-fabricated modular systems:** faster & less construction waste

**Material from nearby areas/factories**

**Use of low-energy materials in construction:** wood, brick, cement, stone, glass easy. Steel needs more energy.

**Perspectives to building:** either build for a long time, or than build reusing previous materials, or build so that material can easily be reused, build so that it is easy to fix, or build a cheap and organic house that can often be remade



## SAFETY - PRIVACY & SPACE

**Natural light** in buildings, Energy efficient lighting such as LED, day lighting penetration of the corridors

**Lower crime rates:** More feeling of community, locality and affordable housing

**Aesthetic:** people are more relaxed, more innovative and efficient, and People take better care of their environment and neighbors.

**Cities with sense of history** or cultural distinctiveness feel familiar, decreases crime rates

**People feel relaxed and safe in spaces** where can see the whole area, that are close to the door, close to shelter and hiding places, there are familiar people and predictable events

**Community - see Grouping**

## MOVEMENT

**Affordable and efficient transit:** bike systems, bicycle loaning, bus network, bus lanes, metro, electric vehicles

**With flexibility:** various methods for people with different needs and wealth

**Maximize moving with zero-emission vehicles:** human-powered vehicles, animal powered vehicles and battery electric vehicles, solar powered cars, hydrogen vehicle etc.

**Compact city:** Work force from nearby areas, pedestrianization

**Pedestrianization:** Dividing city into neighborhoods, where services are at walkable distance. Minimizing disturbances of traffic to pedestrians by having separate routes for vehicles.

**Selling closer to end use,** eg. selling sports equipment near sports area. Using internet for sales system.

**Sparse city:** enough area to locally grow crops and treat water

**Balanced FAR:** compact areas mixing with larger natural and arable lands  
Efficient transportation: packaging, packing in modules that can be assembled



## HEALTH CARE

### Preventive Medicine

**Boost immune system:** breast feeding, malaria-preventing insecticide, vaccines, water sanitation & hygiene, healthy food air water, enough exercise, basic needs filled

**Plan to avoid leading causes of preventable death:** hypertension, smoking, high cholesterol, malnutrition, STDs, poor diet, overweight and obesity, indoor air pollution, unsafe water, traffic collisions, toxicants, infectious diseases

### Good control of disease spreading

**Holistic healing** - mixing basic and advanced needs in same institution, a good example is Hellenic healing - the hospital area is near nature, it includes a hotel for friends, a sports area, swimming pools, a library, learning and discussion area, a theatre and a temple.

## BASIC KNOWLEDGE

See Communication



# Advanced Needs

## SOCIAL RELATIONS, GROUPING

**Small enough groups** are formed, with shared semipublic areas and some services, that create larger and larger entities.

**Amenity and entertainment spaces**, public and semipublic space

**Community needs are created by spaces** – if spaces facilitate, we can have safety and community: Parks and gardens, Amenity greenspaces, Children’s play areas, Sports facilities, green corridors, natural or semi/natural greenspaces, civic squares, market places, pedestrian streets, promenades and sea fronts. (Khalid, 2008)

**Facilitate accessible social networks,**

## COMFORT

**Avoid disturbing sounds in city:** sound walls, sound insulation

**Spaces are functional, flexible, diverse,** suits the inhabitant’s behavior

## ORGANIZATION

**Increase citizen control**

## ENTERTAINMENT

**Amenity areas**

**Services**

## COMMUNICATION, EDUCATION

**Research, training and knowledge** sharing for all

**Manage change**

**Building mixed-use buildings**

**Malls and activity centers** become areas with experiences, introduction to products, distance work and distance learning.

## BEAUTY and ART

**Luxury products** - aesthetic and functional, but also to show status and social hierarchy.

**Aesthetically pleasing environment:** Building codes for making streets more formal, regulates walls, entries, roofs, relation to street etc. Various types of buildings are needed to prevent too monotonous areas, that still have a consistent atmosphere. Use beautiful street scaping



# Time and Effort

What is sustainable economy? Various sources cited this as economy, where the environment is taken into consideration, so that the air stays clean and the foods remain edible.

Other sources see a sustainable, stable economy as a rising GDP and slow, contained inflation. A period with a rising GDP and slow inflation is always finite – we can see this from the history of economy. Sooner or later, a crisis arrives.

To really have sustainable economy, we must have a long-term view and “plan for failure”. These so called “failures” are actually crisis points in the transition of development – they often lead to better more robust and flexible economic practices.

How to plan for an economy with both the highs and lows in mind? How should a certain areas economy be managed, country, town or family?

Key steps in building a stronger local economy are:

1. Analyze the local economy
2. Consider influential current and future trends
3. Develop a clear economic vision
4. Explore economic opportunities and challenges
5. Develop a broad range of economic development strategies
6. Implement and evaluate

(Shaffer, 2004)

Jane Jacobs, when analyzing cities and communities, proposed that the health of local economies be measured by the number of dollars of local

economic activity they generate for every dollar of goods they import.

Understanding economic systems is hard, though, as there are so many moving parts. We could benchmark some ideas from investment portfolio building – that is similar too, as a local economy is practically choosing how to invest efforts, time and funds.

1. Allocation - Choose how much to allocate.
2. Sectors - invest in diverse sectors, preferably all of them: materials, communication, energy, health care, technology, consumer goods, etc.
3. Stock selection - Use online information to choose, or choose what you love, what you are familiar with. (Kawasaki, 2000)
4. Monitor - keep monitoring your stocks (Pearlman)

From this kind of groundwork, we can merge a main idea:

1. **Set an economic goal.** To increase GDP fast taking risks, to be very self-sustained in an unstable environment, etc.
2. **Have economic activities on most sectors,** especially on the basic human needs.
3. **What talent, funds and resources are available locally, or can be accessed?** Invest in these
4. **Encourage a variety of small marginal industries,** that are following local and global trends
5. **Monitor the economic atmosphere,** make changes when necessary

## Energy

The energy humans need is to transform one sort of energy, eg. food, nuclear, thermal - into something else - electric, movement, heat, etc.

So what we actually need is easier, cheaper ways to create the energy types we need, and do the transformation (energy book)

Another problematic issue is, how to transport and store energy for when and where needed - transporting electricity wastes energy. That's why it is a good solution to produce energy near where it is used, or then in an area where it can be produced with maximum efficiency. Storing electricity is also hard - in a best case scenario, we could adjust the amount of energy produced.

This is hard, though - with water dams this is possible, so Norway has lots of adjustable energy. Gas can act as emergency energy.

Altogether, the energy system of all the various energy methods has to be flexible, and can adapt according to winter, summer, daytime, evening. Energy for the poor must often be produced in cheaper ways, eg. biomass reactor, fuel cell technologies.

Saving energy by energy efficiency, is important, as well as using natural methods for achieving needed results, such as methods mentioned in "Temperature" in Basic Needs.

### SOME RENEWABLE ENERGY SOURCES

**Wind turbines:** suitable for windy, empty areas, also seas

**Ground energy:** applying tubes into the ground either shallow, about 2 meters deep, or then deep,

about 200 meters deep.

**Sea:** tubes in the sea

**Water:** Dams in rivers. Big dams affect the environment with many consequences, smaller dams are seen as less disruptive, also known as "mini hydro energy"

**Solar PV:** Solar photovoltaic panels

**Solar thermal:** Tubes that heat water, or buildings with large thermal mass that absorbs heat and stays warm

**Bio gas:** Using bio waste in bio reactors creates heat or pushing movement, not good for electricity

**Incineration:** New fuel cell technologies create energy efficiently, burning wood eg. chips or pellets, biological mass, plasma conversion technique

In the future, we need to explore more energy sources from natural phenomena, eg. Tornado, lightning, geotectonic plate movement



Solar heater for rooftops (Phoenix)

## Implications

Interestingly, we see that there are many contradictory ideologies. This means that neither answer is correct, but the solution should be chosen case by case. It is important to have many methods available, and choose the suitable one, instead of just knowing or affirming one solution. There are many needs that we should consider more, when creating sustainable solutions, such as information spreading, connectivity, learning, and social needs of an individual. Also robustness or system is important, when considering the unstableness of Earth.

Sustainability started as an ideology of minorities, then spread to more and more professions. Now it is mentioned in almost every project, regardless the industry. It could be seen that it is the new prevailing ideology, after the "high-tech solves all" ideology, that burst as the IT bubble burst and turned out internet businesses alone cannot save the world. "A Crisis is when what used to work, doesn't work", defines Future researcher Linda Groff.

What sustainability is actually doing, is creating opinions on ALL of the aspects humanity needs to survive and develop alongside our environment. It is going towards the direction of understanding hu-

man mind, social communities, and environment.

Us humans, instead of controlling just ourselves and our immediate environment, are starting to understand the globe enough to make the whole world our biosphere, that supports our existence and development. Sustainable ideologies are starting to manage the aspects to keep us going, instead of just relying that "it will go alright, let's just keep doing what we're doing, and using whatever cool inventions we can think of"

Of course, an opposite view could be taken, of high technology that can solve all our problems. In the 1990, there was a "technology craze", with everyone believing that technology is the ultimate key to development, and it will have no limits. Why have the past ten years seen sustainability issues gain importance, instead? Because Sustainability is the new technology after technology - we are starting to understand nature's mechanisms and use them.

We can see sustainability, or holistic development, as the next emerging trend, now that the technology trend is slowly subsiding, and we have noticed that it's missing focus and results.



Life Cycle Analysis of buildings (Jokela)

# HOLISTIC PLANNING

## Theory of Urban Neighborhoods

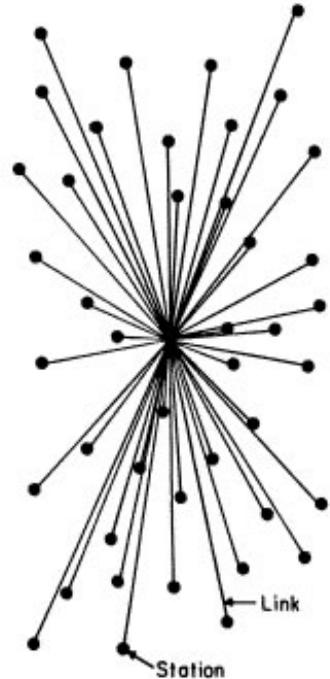
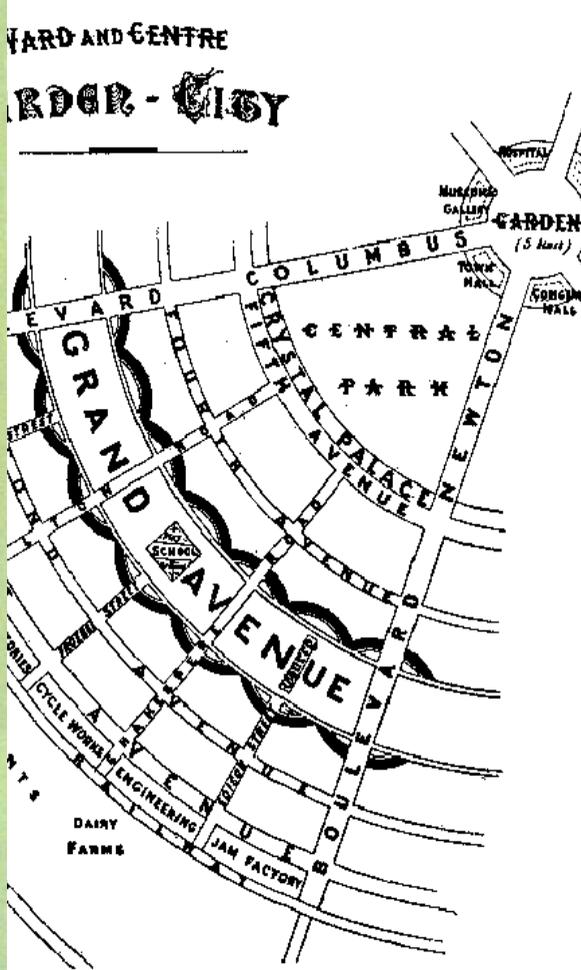
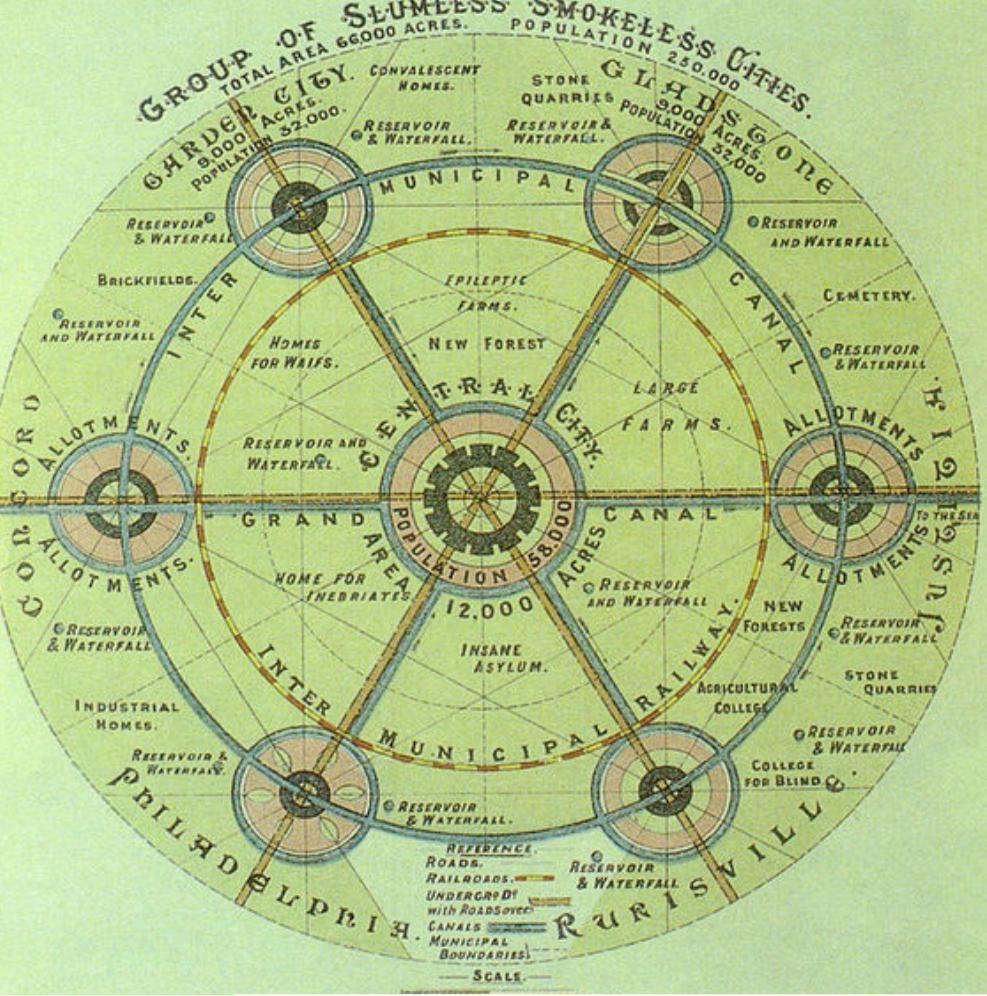
As now we have a pretty good idea on sustainability, we can progress to really implementing it in a holistic solution. What kind of network does it form? How are the functions distributed?

One of the first, classic ideas is the "Garden City" (Howard 1898). The concept is an urban structure where self-contained communities are surrounded by green belts, and containing areas of residences, industry and agriculture. This idea has been often cited and varied since, for example in city theories with farming and amenity spaces exist in the green areas. (Alexander, 1977). Later, Peter Hill, highlighting the economic, cultural and management issues, sees that these self-sustaining small clusters should form larger entities that can sustain more specialized functions, like cultural events and technology development – a greater system must be formed, instead of totally self-sustained units.

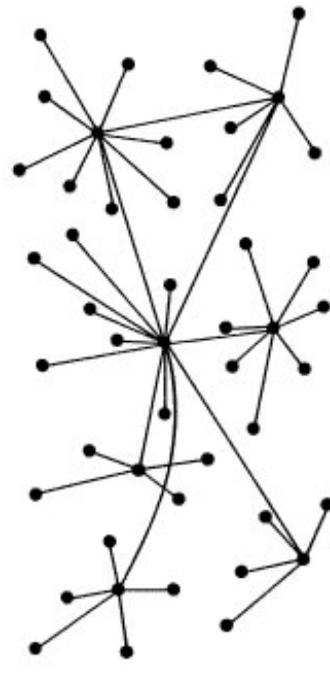
An implementation aiming for the "garden city" ideology is the EcoCity project in Tianjin, China, starting from 2007, one designer being Eero Paloheimo. Every neighborhood strives to be self-sufficient, and contains jobs, amenities and education facilities, also energy and water management happen in the area. This ideology is not consistent with the original idea of partially self-supporting connected neighborhoods, it's also against the development of humanity, where density creates complexity and

diversification, which in turn creates development, high culture and efficient solutions for living. The project has been widely criticized in China as unrealistic, (Zhang, 2011) a "solution that has no market", as it's inconvenient for China's rich people, and too expensive for poor people and even the middle class - This is why it's still a "Ghost town" with little to none inhabitants (Li, 2012)

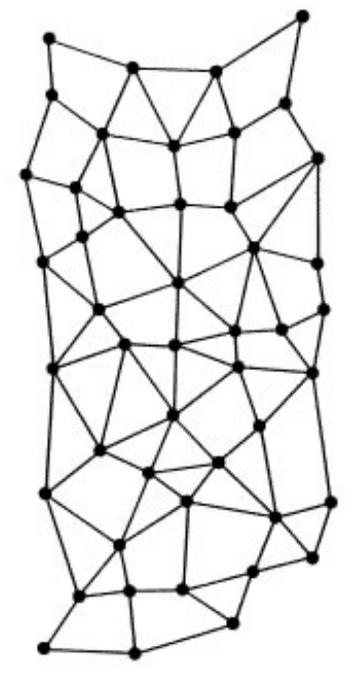
If we extrapolate from the history of humanity, it seems development has always come through more dense human structures, that are enabled by more advanced technologies to feed and clean the citizens, more advanced "social glues" that keep the people content and cooperative with each other, as well as more flexible economic solutions. Density, it seems, is useful in development. It creates spare time, and then new jobs, that can spend more energy on networking, learning, and creating new non-existent solutions. Another necessity, atleast for now, is centralized or reasonably concentrated wealth – only by some people, groups, countries or continents having more, is it possible to have enough surplus money to use on high-risk innovation projects.



CENTRALIZED (A)



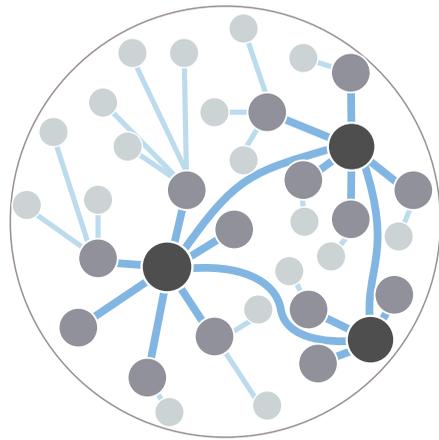
DECENTRALIZED (B)



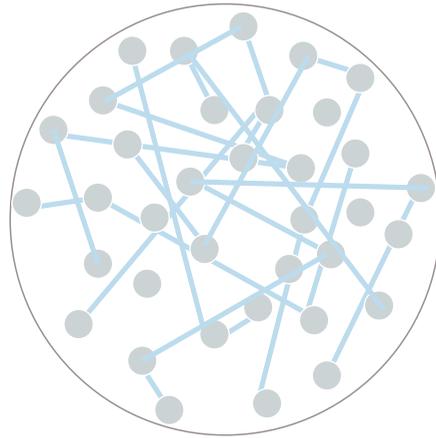
DISTRIBUTED (C)

*Garden City (Ebenezer Howard)*  
*Network types (Paul Baran, 1960)*

Organized Network

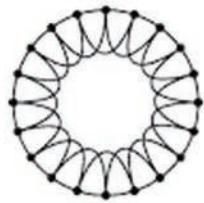


Random Network

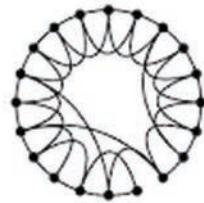


Networks

Regular



Small-world

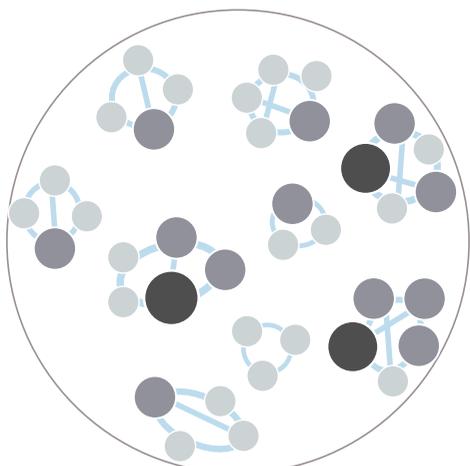


Random

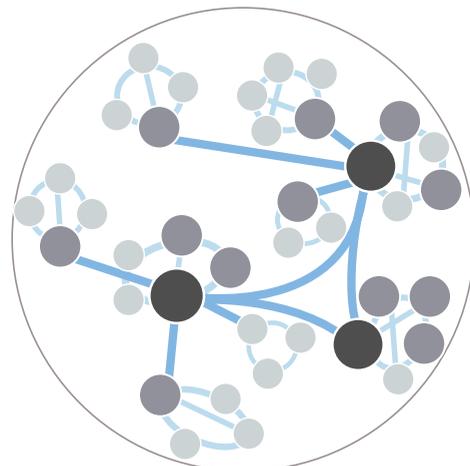


Increasing randomness

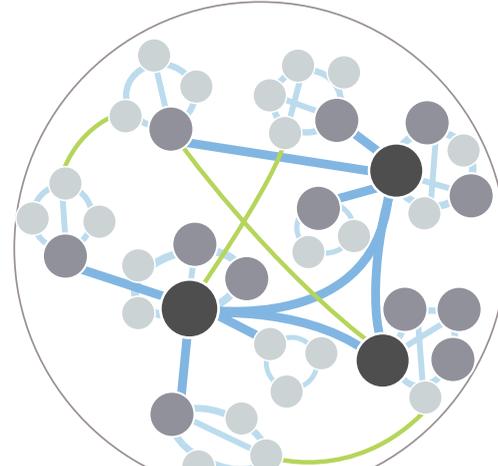
Forming of Small World Connection in Urban context



Local clusters



Paths to hubs



Random connections

# Small-world Network

A small-world network might be a solution. It is a model of efficient connectedness in nature. Nodes from cliques in which they are mutually connected with each other, with a few nodes acting as a path and connecting to other nodes, some of them being hubs which have a high number of connections. With this model, maximum connectivity is reached with minimum complexity, and any part can connect to any part with a limited amount of connections.

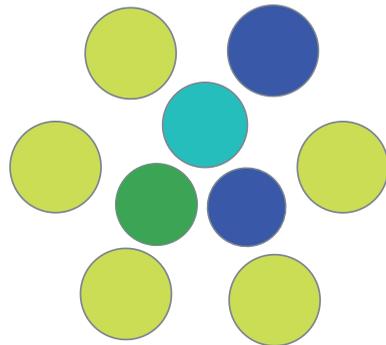
Many real-world networks work like this, for example social networks, connectivity of Internet pages, gene networks, brain neurons, road maps, food chains etc. Networks that arise from spatial or temporal proximity are not as probable to form small-world networks, as space and time constrain the connectivity. A possibility is also that these kinds of networks are more robust than other network architectures, though they are more vulnerable to targeted attack of hubs. (Strogatz, 2011)

This model is sure to work for modern societies, as more and more connections become virtual and not limited by space, also transportation and logistic systems become more efficient in connecting far away nodes. To take into account the spatiality of cities, the nodes of the clique can be less connected, and various clique groups don't have to be side by side.

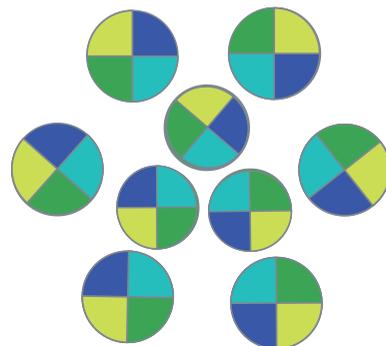
By planning for a small world network, where there are connections with close urban areas as well as random connections to far away ones as well as hubs, we can achieve a connected society without too much complexity. This is a solution for connectivity in villages, towns and cities: They form closer relationship clusters with neighboring cities by sharing services - some of the cities in the cluster connect virtually, logistically or educationally to larger hub cities.

# The 20-80 Distribution

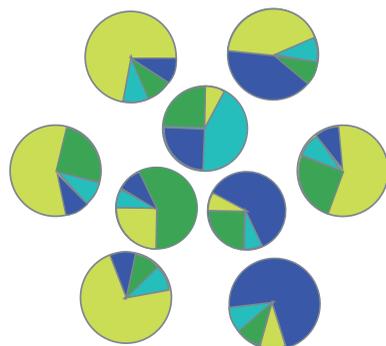
## Function Distribution



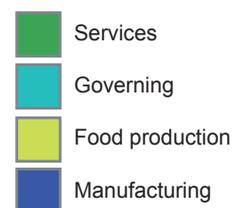
Specialized



Self-sustained



Mixed Sustained specialization



The 20-80 rule is the Pareto principle, also called “the law of the vital few”. It means that roughly 80% of the effects come from 20% of the causes. This is true in nature, where 20% of the pea pods in the garden contain 80% of the peas, as well as in education, where 20% of the activities cause 80% of the learning, and business, where 80% of the income comes from 20% of the customers. (Newman)

It is also used in another way: by focusing on the vital 20%, 80% of the total benefits can be gained. This is used, for example, in time management and body fitness, as well as learning new skills such as languages (Timothy Ferriss, 2012).

So by aiming to do only the 20% of most vital, closer to 80% of the results can be achieved. In sustainability, each local city, community or household should not aim to be totally zero-energy and sustainable, but do the core 20% that matter.

This Core 20% would differ according to area, depending on what it’s main industry is: each area should put effort in adding sustainable functions outside it’s main industry, thus gaining a significantly more balanced range of activities. Sustainable functions would be those mentioned above in the sustainability area, including ecology services, diverse economy, and social activities such as governing, culture, communication and education.

This way, no community is totally self-sustained, but at least has the basic skills and knowledge of all the necessary sectors, and people remain conscious on these other aspects. This is a better division than 10-90, where striving for self-sustaining would slow down development, 90-10, where the community

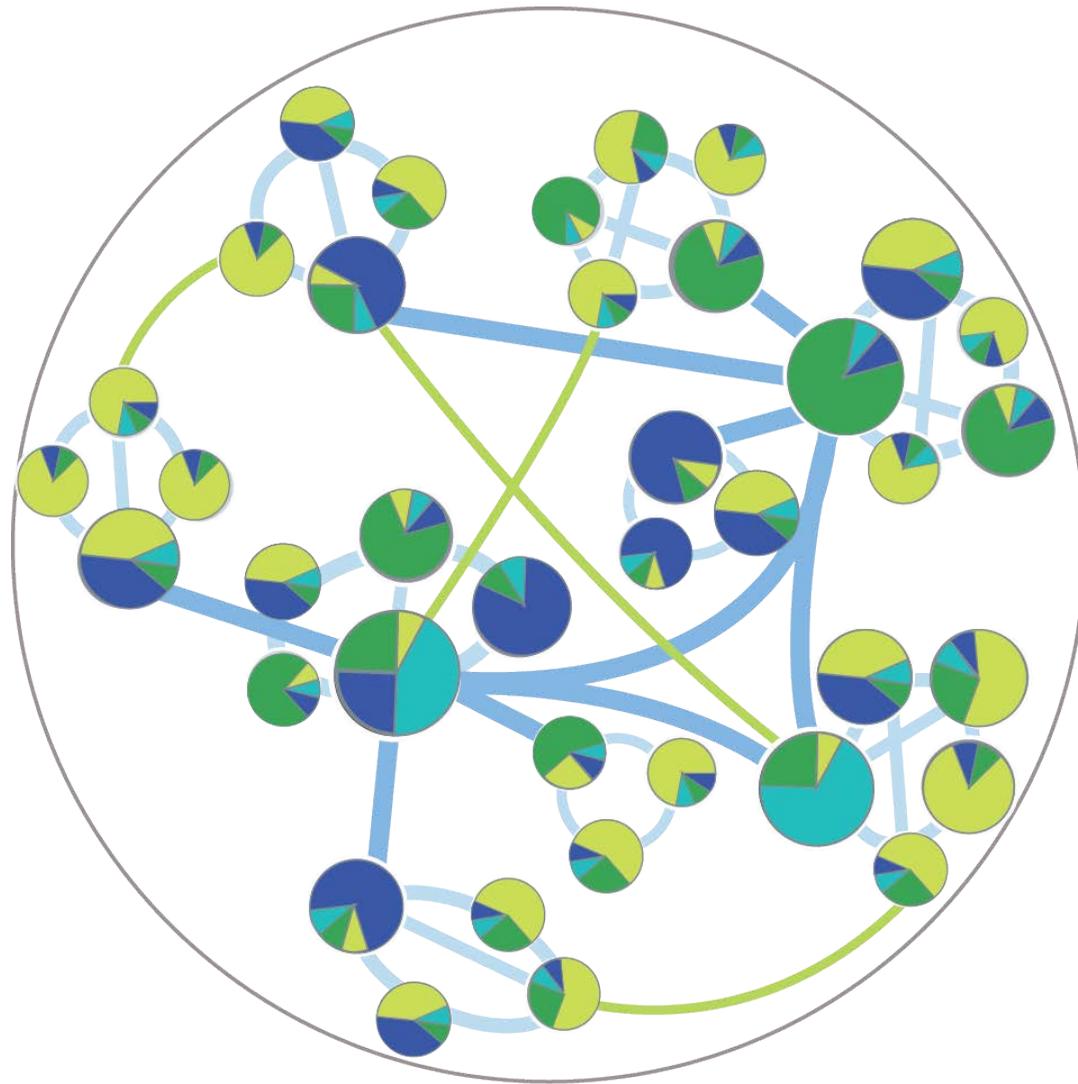
is very vulnerable for changes and emergencies, or 50-50, which would significantly impair the core value production and thus development - people can only have one priority at a time.

In the case of a city, where the main effort is on service production design and research, it could still maintain 20% of it’s inhabitants time and effort on managing waste and water, growing crops etc., thus though not being self-sustained, then at least good for short-term emergencies,

In the case of a village, though focus is on crops and livestock, 20% of the effort must be diverted to waste management, governing the area, doing handicrafts or other small-scale manufacturing, and connecting with other villages and cities.

One of the finest things in our modern society is the ability to distribute tasks according to strengths, store and trade. A certain amount of self-sustainability is necessary for emergency situations – if the economy suddenly goes down - lets say, the prices of coffee beans plunges, or local terrorists create an unsafe trading environment. This also addresses the problem of “cities are unsafe in crisis” discussion. (Rawles, 2009). Partial self-sustaining practices also make sure the basic skills exist locally, and that people understand the ecosystem. Even if water comes from a centralized tap water system, some rainwater collection tubs for watering plants keep people aware that water is limited.

# Concept of Urban Systems



Small-world connection  
with  
Mixed Sustained Specialization

**Small-world network:** Clusters with neighboring areas on cooperation that happens on physical levels, also creating non-physical connections to other clusters and central hubs

**Distributed functions:** Partial self-sustainability & focused specialization, so that every block in some way has every function, but is specialized in functions suitable for it.

The concept is to implement sustainable solutions, so that with nearby areas, some services are shared, and other services with faraway areas. A village shares transportation, water and waste management with nearby villages, and education and culture production with a city. A metropolis could out-source food production of specific foods to villages, and a village gain from upper education systems in a city or a metropolis and can even participate in specific projects.

This model is already true - villages have connections to other villages via relatives, connections to farther villages via marriage partners, connections to towns via business, relatives and schools, connections to big hub cities via migration workers and universities. If a village has a connection to another village, it can gain knowledge on, for example, how to grow mandarins. With the connection to large cities it knows what citizens want, and can partially specialize in mushrooms or ecological foods. By having connections to near by urban places as well as far away random cities and hubs, an urban community can fair economically and academically much better.

To help with planning, I have divided the basic sustainable systems:

## **BASIC NEEDS**

- 1. Food & plant system**
- 2. Water & waste water system**
- 3. Waste system**
- 4. Temperature system**
- 5. Building system**

## **ADVANCED NEEDS**

- 6. Transport system**
- 7. Community system**
- 8. Education & hobby system**
- 9. Aesthetic, comfort and culture system**

## **EFFORT AND TIME**

- 10. Buying, selling, cooperation system**

When planning these systems can work as guidelines, even though in the planned solutions they are not separable any more, as one element can be a part of many systems. It should also be decided case by case, which elements are shared with local areas and which ones with distant hubs.

# PLANNING - 4 CASES

## Urbanism in China Now

Urbanization has been happening at a huge pace, with China's population being 1,390,510,630, and over 50% in cities (China Population Census 2013). Megacities like Shanghai, Shenzhen, Chongqing, Beijing, Guangzhou have 10-35 million inhabitants each, with migration workers adding millions more, up to a half. Recently, the Chinese Government plans to encourage more migration into small and midsize cities. Still, China ceased to grant the official name of "city" in 1996 – this means that the official number of cities is not growing, and many cities even with a couple of millions of people are seen as "counties" (Roberts, 2014)

The internet age is coming quick, with 1 billion mobile phones in use, and 4G service being provided in for example Shanghai (Gartner 2014). The transportation and logistic network are already very organized for a developing country, and as infrastructure is heavily invested in, more development is to be expected. Education, too, has seen changes: as of 2011, over 81% of Chinese students continued their education to receive a secondary education degree. Education quality in smaller schools is still a challenge. (World population statistics)

At the moment, waste management, water treatment are worse in small cities and villages, where modern plastics and factories have entered, but

inhabitants are still not informed of how to take into account the environmental aspects. In some cases, when municipalities or foreign banks help, the treatment plants are too expensive for the inhabitants to fund, thus exterior finding is needed continuously. This has seriously affected the health of people, with more and more cancer cases yearly.

## China's Urban Future

What does China's future urbanism look like, then?

There are huge challenges, as the change is so fast: Land and spatial development, quality education and talent creation, funding for services such as water, waste, transportation and healthcare services. Problems arisen in urbanization are pollution, congestion, land distribution and unequal division of economic benefits. Despite the central government and general frameworks, political decision-making happens in fact locally, thus managing urbanization fall in the responsibilities of local municipalities. This leads to a huge difference and inconsistency in how urbanization issues are managed. (McKinsey, 2009)

McKinsey & Company has done various thorough researches on China. In an overall study in 2009, they suggested four future scenarios: Supercities, Hubs and spokes, distributed growth and townization, with hubs and spokes being the most probable future outcome: large central cities connected to each other, with medium cities around them, connecting to towns and villages in the periphery. This model needs more energy for transportation than the other models. Large and medium cities might even agglomerate to form a giant megalopolis – an entire coastline, a seamless mat of urban space without natural area or food production. Too high densities are already lowering life quality and arable

land is lost – these might not be a problem, if they are solved in other ways, etc. vertical or density farming,

In 2013, McKinsey's Jonathan Woetzel sees the development happening as clusters, agglomerating together and becoming hubs, and a lot of the development happening in the cities. "The competition is no finding those technologies that can both increase productivity and be good for the environment and deliver a high quality of urban life to the citizens".

As the case area, I have chosen four areas that I am more familiar with, and implementing my concept of sustainability and networks, in the aforementioned context.



# Planning Scope

To show an implementation of Sustainable techniques, I have selected four human habitats in China: a village, a town, a city and a metropolis. This way we can see a wide array of urban space and activities.

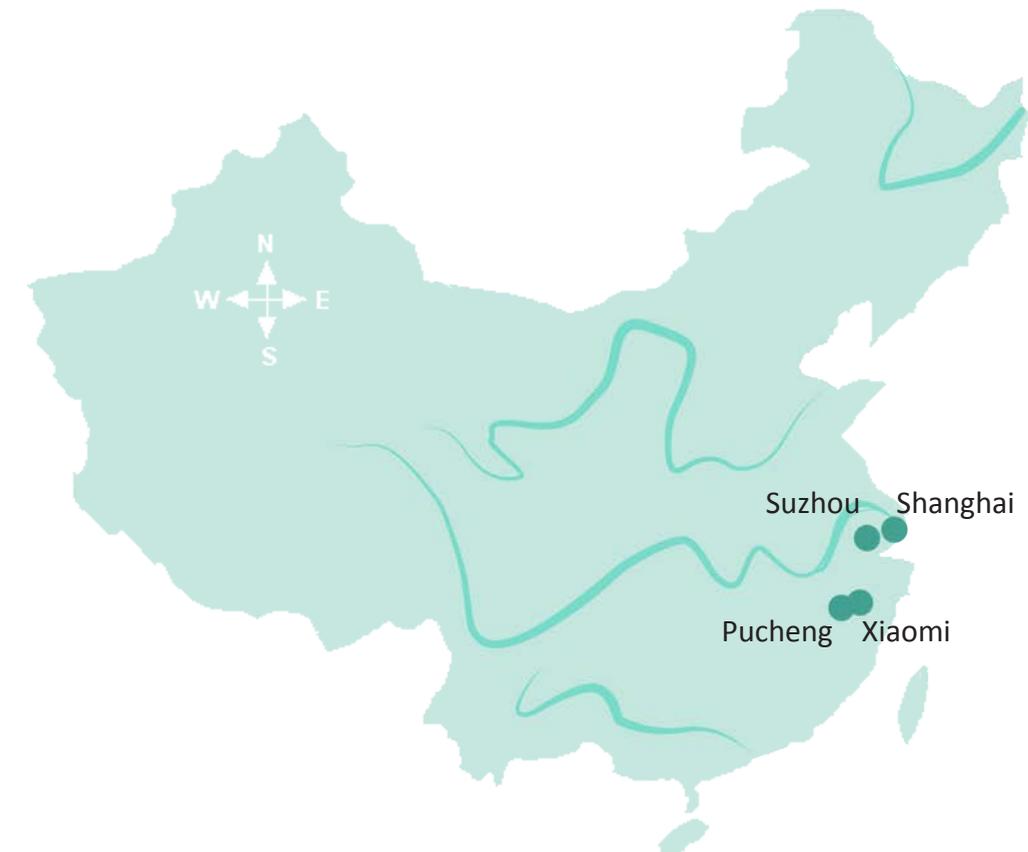
All areas are reasonably close, in the south of China, so that they still have natural connections. The village and town are still far enough to not be in the immediate vicinity of the metropolis.

Shanghai and Suzhou have already started agglomerating into a huge urban area. In the province of Pucheng, though, most villages and towns are still badly connected, partially because of the moun-

tainous region.

First the region is introduced, then a residential block is selected and introduced in-depth, including resident profiles of the area, based on existing residents.

The development solutions I suggest are not horizontal development - planning to create towns from villages, cities from towns, and metropolis from cities. Each urban model is an important piece of the network just as it is. Thus, the solutions are vertical development - this means it is in the relation to the city itself, planning it to be a "more perfect" version of a village, town, city or metropolis.





# SHANGHAI - Metropolis

CITY: Shanghai

Size: 6340,5 km<sup>2</sup>

Population: 25 000 000

Migration: Estimate of 10-15 million migrant workers

Location: Yangtze river estuary, coast of East China sea, 1084 km from Beijing, capital of China

Climate: Subtropical monsoon climate, mild and humid climate, average 16 degrees

Division: 16 districts, 1 county

Attractions: The Bund, Yuyuan garden, CBD area, 2010 World Expo area, Nanjing road, People's square

Transportation: Is one of China's largest hubs. Has long-distance coaches nationwide, and many high-speed roads and railways. 2 Airports, multiple railway stations, 567 km of metro line, the first operational maglev train, Shanghai Port has 1140 harbour berths.

Geography

Water resourcesL Lakes and rivers over 500km, mostly not potable. Abundant rainfall

Economy: The service sector is the most important and fastest growing area, with thousands of shopping malls and service businesses. Manufacturing in slower growth, and agriculture focusing in special products, especially aquatic produce

Agriculture: More than 1000 crop species cultivated, mainly poultry and livestock, aquatic resources such as fish and crabs

Industry: Some natural gas and minerals in East China sea,

Manufacturing: Industry is still strong, but growth has slowed. first industry 12 billion yuan, secondary industry 802 billion yuan, tertiary industry1344 billion yuan

Business: Shanghai stock market is very strong, lots of business and financial sector operations. Shanghai has consulates of various countries.

GDP 2,160212 trillion yuan (2013)

Sustainability: A growing amount of agricultural foods are grown ecologically. In architectural and urban planning, some sustainable elements are required. The local government has various plans to increase waste and water management.

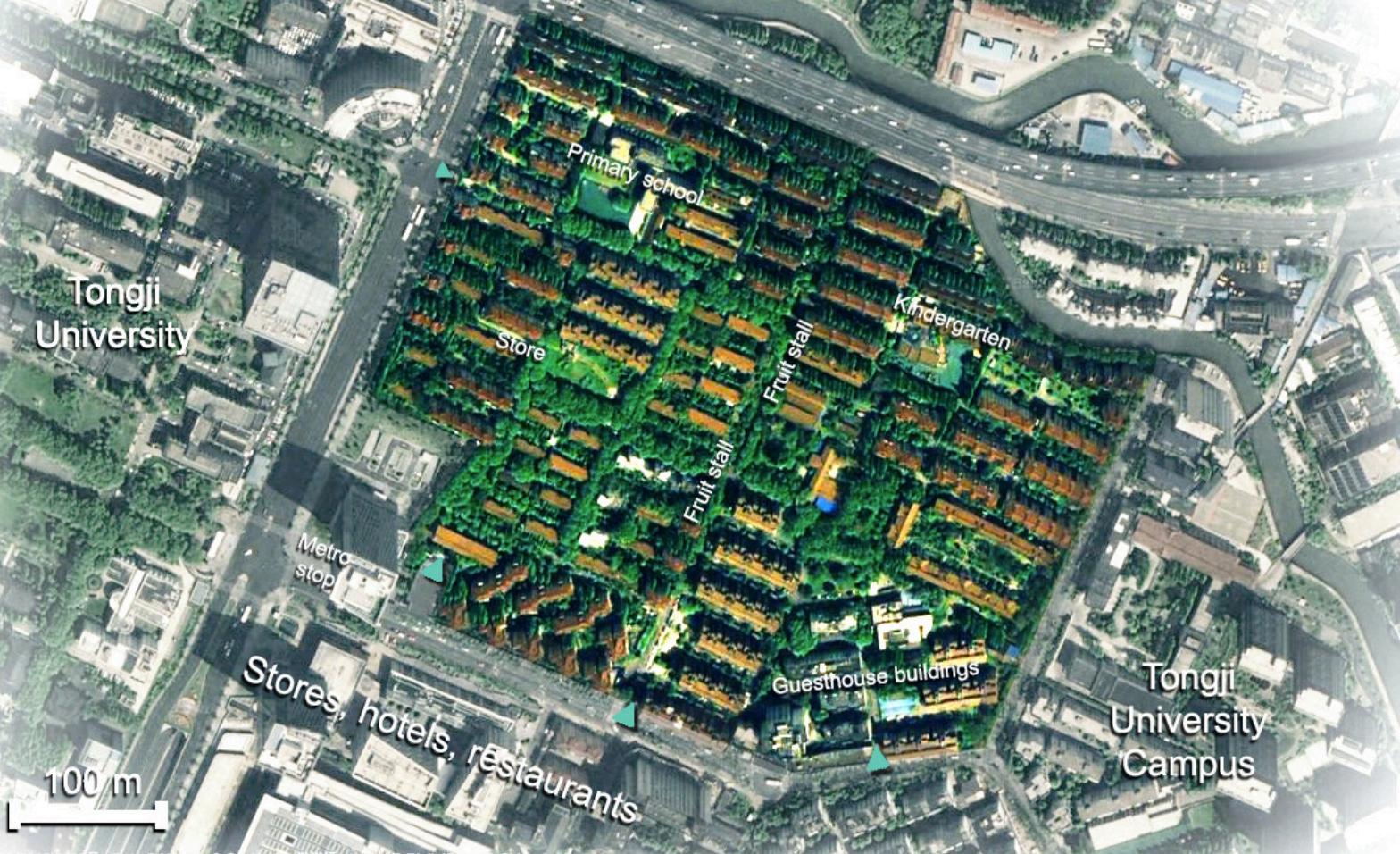
Education: Many famous universities, such as Fudan, Tongji and Jiaotong, with students from all over the world.

Technology: Technology parks and a strong technological industry

Culture: Many movies, TV series and a lot of music is made in Shanghai. The world Expo was held in 2011. There are museums and new art museums, festivals, the western culture is also strong amongst foreigners

Languages: Shanghai dialect, Mandarin in schools

# SHANGHAI - Tongji New Village



Block: Tongji New village

Inhabitants: 1500-3000

Age: Built in the 1960s

Location: Right at next to metro line 10, right next to elevated high speed city ring road, right next to Tongji University, 10 stops and one change to Central square, 3 metro stops to huge Wujiao Square shopping mall group, in proximity of 2 parks

District: Yangpu District, an old and slightly disorganized area, that is well known for its many education facilities, such as universities and high-schools.

Main inhabitant groups: students, teachers, professors, migrant workers, families with children, empty investment apartments

Building types: 2-6 story concrete and wood frame apartment buildings. Has 1 primary school, 1 kindergarten, guesthouse complex for university visitors, 2 fruit stalls, 1 mini-market, 2 vegetable stalls, 1 senior club house, about 10 small gardens. No official stores are allowed in the area, only stalls.

Intro: Tongji new village was originally built to accommodate the professors and their families of Tongji University, just on the other side of the road. They were given out for free. As the buildings are old, many have since moved out, and rented out to students or migrant workers, so that the main image is a bit disorganized, some areas are downright derelict. The low buildings and well-designed network of gardens make the area cool even in summers, with lots of people spending time outside. There are many small shops on the road nearby. The future of this area is probably to take it down and build high-rise apartments, in 20 years when the university's lease on the land ends. In China, land cannot be owned, only leased for 70 years from the state.





**Wang Apo, Female, 88**

Born in Ningbo, her family was in the first wave of migrants to Shanghai, and went there to start their own business. Surviving the war at twelve years old, she then married to a professor and had four children, working as a secretary. All children were sent out of Shanghai in the revolution, but came back later and studied at university. Two moved to the United States to study, work and establish families, two stayed in Shanghai. In her free time she meets with other seniors in the gardens to chat and play games. She has lived over fifty years in Tongji new village.



**Zhang Feifan, Male, 34**

Originally from the capital of Jiangsu province, he came to Shanghai to study his Master's degree in management. He then entered an international company, and worked there until he could take a loan and buy an apartment with his wife. Their child is outside of Shanghai, cared by the grandparents, as they have more time. Because Zhang and his wife have received Shanghai hukou, official citizenship, his child can come to Shanghai for schooling.



**Li Yuan, Female, 26**

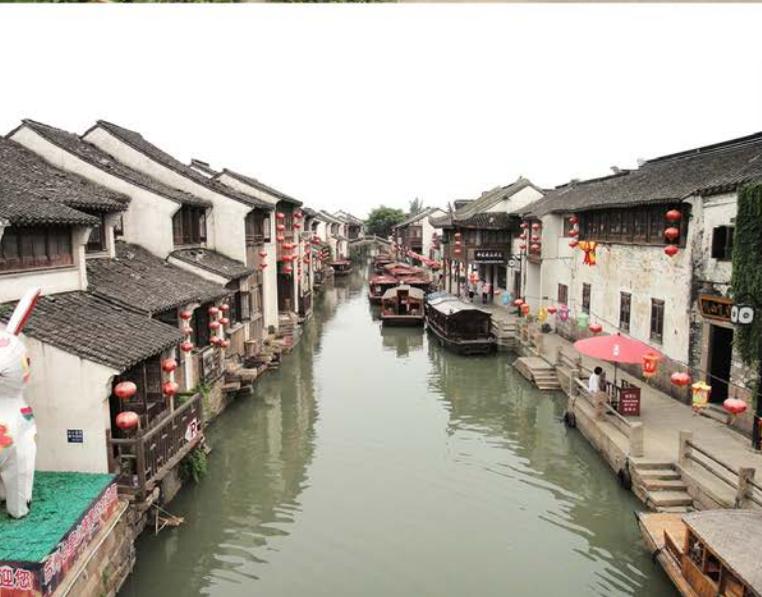
Her relatives are all first-wave Shanghainese. As a child, she grew up with her grandmother, as her parents were sent out of the city like all educated citizens in the revolution. Her parents have returned, and she visits them weekends using the metro. She is renting a room in Tongji new village, with three people in two rooms, as she is studying her master's degree in design in Tongji University. She often takes part in international learning projects, and does some freelancing work on the side.



**Ma Jun, Male, 41**

Originally from a small village in Anhui province, he has already worked 11 years in Shanghai. He is renting a room with a group of migrant workers. The pay is low and the work is very hard, for cleaning and construction. He does not like Shanghai much, and often uses alcohol. He has been learning martial arts on his free time, and plans to return to Anhui to start a martial arts and mediation center, probably after the Chinese new year.





# SUZHOU - City

CITY: Suzhou

Size: 8848 km<sup>2</sup>, of which city area 2742 km<sup>2</sup>

Population: 10 654 000, urban 3 289 900

Location: In the southeast of Jiangsu province, south west of China, at coast of Taihu lake, 85 km west from Shanghai

Climate: Subtropical humid monsoon climate

Division: 5 municipal districts, 1 county, 4 county-level cities

Attractions: Taihu Lake, Jinji lake, various famous traditional gardens and temples, water-towns known as “Venice of the east”

Transportation: International airport, 6 railway stations, 5 bus terminals, 4 metro lines

Geography: 55% is low-lying plains, hills in the west, dense river network

Water resources: various large lakes, Taihu is the second largest freshwater lake in China, many rivers, abundant rainfall

Economy: A lot of Industry, Businesses, some high-quality agriculture on rice and fisheries

Agriculture: Rice, wheat, canola, cotton, fruit, tea, especially fisheries with fish, hairy crabs and shrimp

Manufacturing: Of various industries, e.g. machine parts, elevators, bio-tech, plastics.

Business: International Businesses from all over the

world, second largest foreign investment in China, 470 of fortune 500 companies

GDP 1,3 trillion yuan (2013 estimate), \$18,853 per capita, one of the highest in China

Sustainability: increases amount of organic foods

Education: Pre-school enrollment rate 99,9%, higher education rate over 60%

Technology: National research institutions and Technology parks

history: One of the oldest cities in China, founded in 514 BC, has long been a political, economic and cultural center

Culture: Tens of traditional Chinese gardens, pagodas and pavilions, a couple of water-network villages, an opera house, many old paintings and art schools, famous cuisine

Languages: Suzhou dialect, similar to Shanghai dialect though mutually unintelligible. Schools teach in Mandarin.

# SUZHOU - ZuoAn Apartments

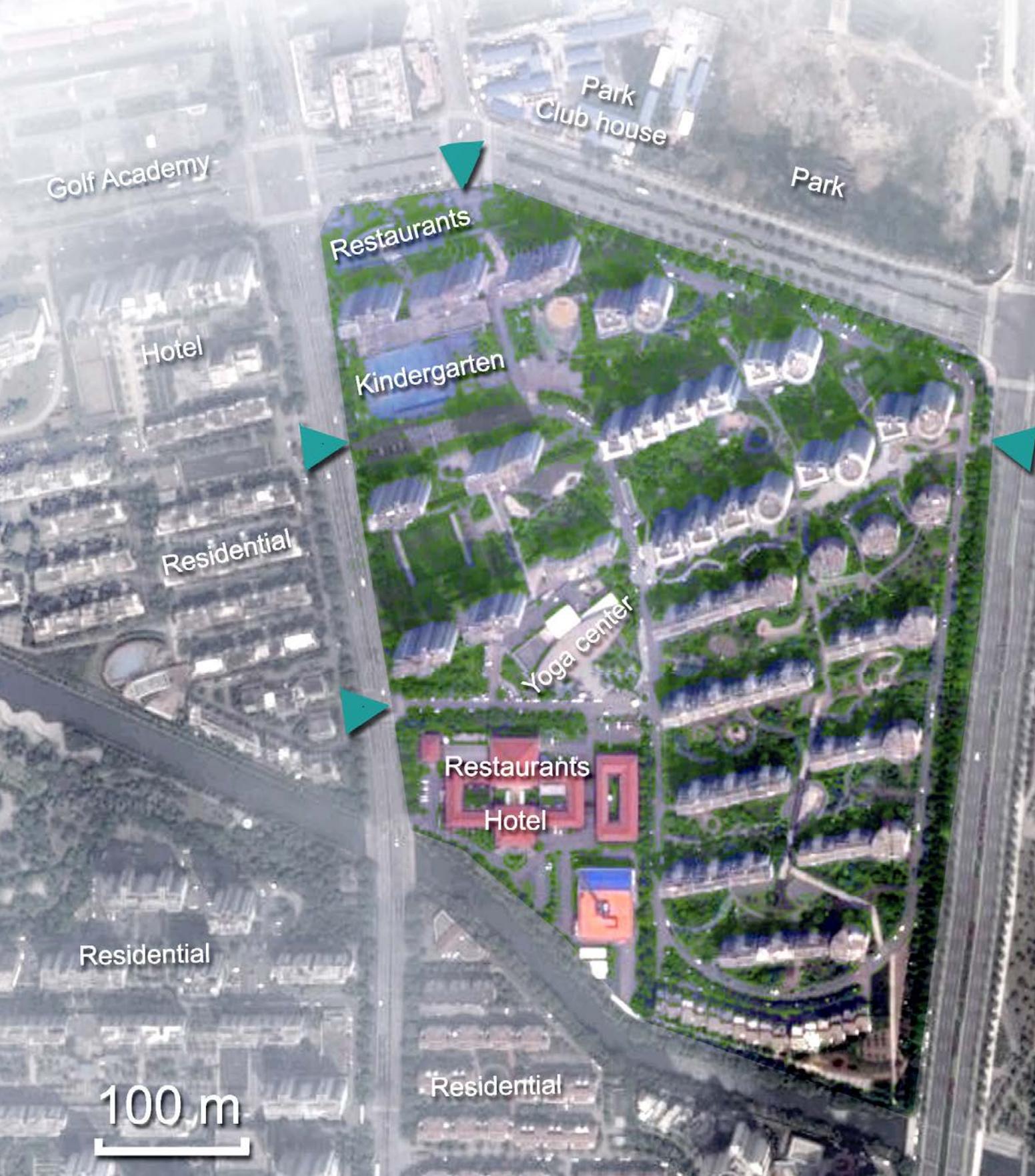
Block: Zuo'an Lakefront Apartments

Location: Near Jinji lake, 8 km from the center

Inhabitants 1500 – 2500

Age: Built in 2005

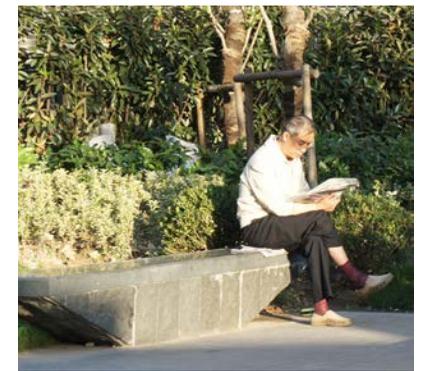
Intro: After a rapid economic development, Suzhou has invested strongly in developing luxury apartments and villas, as well as public areas for tourists. The lakes are cleaner than before, even though swimming is still not recommended. The Zuo'an lakefront apartments are strongly branded to be luxury. It is well connected, and next to a new public lakeside area. The inhabitants are wealthy, and a strong international brand is made with a golf club, English-speaking kindergartens and high-class hotel, 200 parking spaces underground. Many buildings are empty investment buildings.





**Tong Li, Male, 42**

He grew up in a small town near Suzhou, and came to study and work in Suzhou. For his master's degree, he went to a university in Shanghai. Later, he established a business with his friends, found investors for a small factory in Shanghai. When space became limited, they decided to enlarge and move the factory to Suzhou Industrial area. He bought an apartment in Suzhou for investment purposes, lives part of the time in Suzhou, and commutes to Shanghai to his family by car, utilizing the new high-speed road network.



**Yu Wei Hong, Male, 26**

Born and bred in Suzhou, he became interested in computer coding and developing. He started as a freelancer, but then joined a small team focusing on making applications for Apple products. Many projects require meetings in Shanghai, which is a convenient trip by train. He lives with his relatives, but wants to save enough money to buy an apartment and get married.



**Zhao Feng, Female, 21**

Before she lived in the farther suburbs of Suzhou, but as her family's financial situation became significantly better, they all moved to the center to support her university studies. She enjoys walking in the city center, she has also visited Malaysia. Next year, she will go to study in a university in the United States. She wishes to find an interesting job when she returns.





# PUCHENG - Province

PROVINCE: Pucheng Province

Size: 3 374 km<sup>2</sup>

Population: In the whole county, there are 407 000 people, of which 71 600 are non-agricultural, over 100 000 are outside as migrant workers. Population increase 0,42% per year (2006)

Location: The north of Fujian area, 218 km to closest official large city, Fuzhou. 464 km to Shanghai.

Climate: Subtropical monsoon climate, average temperature 17,4 degrees.

Division: 9 towns, 8 townships, and about 300 villages

Geography: Mountainous, flat in the south. The valleys are arable land.

Water resources: Lakes and rivers. Some of the water is drinkable, but a growing number is affected by eutrophication caused by agricultural runoffs. Rain-fall changes according to season.

Economy: 2008 full-year GDP of 4.14 billion yuan, an increase of 14.3%

Mainly agriculture, but also some manufacturing and handicrafts. Power plants are not sufficient for a growing demand in power.

Agriculture: Focus on grains such as rice, tobacco, edible bamboo shoots, mushrooms, livestock such as poultry and aquaculture production.

Manufacturing: Sawmills, rosin factories, rice mills,

iron mills, as well as wood, bamboo, palm and handicraft businesses. This means metallurgy, textiles, ceramics, eg. silk. More industry is expected, eg. biotechnical industry, steel door production, and petroleum.

Sustainability: More green projects have been started on have non-pesticide vegetables, organic pork and poultry, as well as “green” agricultural industry enterprises.

Technology: A lot has been invested in internet, tv and phone connectivity, with television coverage already reaching 80%. There is an active community of online technology, with various professional societies and more than 5000 people, creating useful applications and implementations both nationally and provincially, for example better rice ridge cultivation for mountainous areas.

Languages: Most villages speak their own dialect which are mutually unintelligible, the southern dialects are similar to the hakka dialect family. Schools teach Mandarin Chinese, which is the most used language in

# PUCHENG - Town & Shuinan area

TOWN: Pucheng.

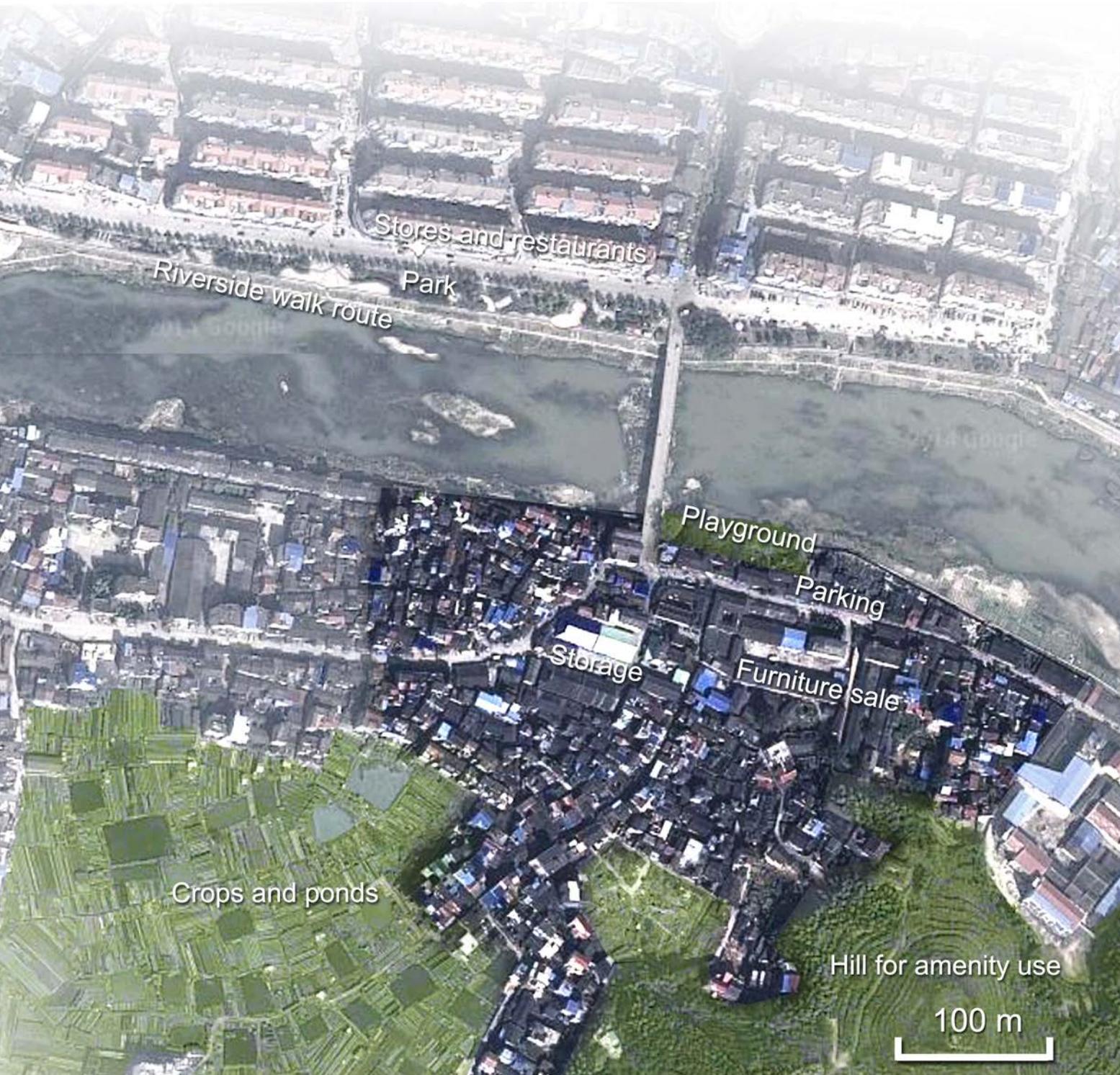
Size: 12 square kilometers, estimation

Population: 40 000, estimation

Intro: Pucheng town is the centre of Pucheng county, thus . There is a reasonably famous forest nearby, but otherwise tourists are rarely seen. The buildings are simple concrete buildings built after industrialism, built quickly, cheaply and simply, few historical buildings are seen. Many inhabitants are originally from the small villages, and have then come to live in the town. The town has good connections to Fuzhou, Guangzhou and Shanghai, 5-10 hours on buses and trains, with many work-aged inhabitants continuing to migrate there for work. Senior citizens live in the villages, with children and work-aged people living in the Pucheng town with more available work and education facilities. There are many schools, hospitals, shops and services, with the manufacturing being farther away. Some fields and fish farms exist at the sides of the town, providing extra income for some families.

BLOCK: Shuinan, North side of Pucheng

Shuinan is on the other side of the river, just a walk from the city center, but already more an living environment than an commercial environment. Most of the buildings are 1-4 stories, and for living use. They are made of wood or concrete, and are not fixed properly, though most of them have electricity and running water. Nearby, crops are grown and fishes farmed, even though this is just of extra income.





**Zhu Jun , Male, 32**

Originally born in a small village over an hours drive away, Luo spent his childhood there as an only child, learning to farm mushrooms, fungus, bamboo shoots and poultry. As a young adult, he moved to his aunt to Guangzhou, where he worked as manual labor and dog trainer. Later he worked for a long time in Shanghai, in his free time learning to make textile products and talking with various artists. At thirty, he returned to Pucheng and started a family, opening his own business selling motor-bikes and small accessories.



**Luo ShiMei, Female, 18**

Her parents moved to the town from a small village a long time ago, and she was born and grew up in the town. Her family is comparatively well off, with her father travelling often in his work for a steel company. She spends her time drinking milk tea, buying cheap clothes, and attending after-school art lessons, according to her cousin's recommendations. She wishes to marry rich and never have to draw again.



**Han Meiyuan, Female, 46**

Originally from another town, she married a teacher in Pucheng, and was a stay-at-home mother. As her son has already moved to Fuzhou to study architecture, she gets extra income from selling nuts, dried fruits and other luxury foods bought from other parts of China, with her home as her base. She is actively a part of the community and knows all the students of her husband personally, helping them learn. She wishes her son to work hard to gain skills, even though he sees studying as too theoretical, useless and boring.





# PUCHENG - Xiaomi Village

Village: Xiaomi

Location: A village in the county of Pucheng, 40-minute car trip to town of Pucheng

Population: 200-300

Main industry: agriculture, growing bamboo shoots, sugar cane, rice, fungus, mushrooms, jujube fruits, also a few small shops

Intro: Many people are moving away, but some are coming back too. After the new road was built, many renovations have been done, and even a couple of 2-story concrete houses have been built by returnees. Some of the buildings are still disintegrating fast, as no one lives there. The only children in this village are those who are very small, or whose parents can't afford education in the town. Because the schools are far and low quality, some kids end up half-illiterate. In the near times, three children have managed to get to university. Every Chinese new year and other festivals, the village fills of life, as children and grandchildren return for weeks.

Utilities: Drinking water comes from wells, used water is disposed of to the river. Many people don't have water toilets, but holes that are emptied or the waste flows to a trench. Water toilets empty in to trenches too. Clothes, shoes and vegetables are washed in the river, that is much dirtier than before, especially the beaches are full of trash, food wrappings and construction waste. The village is connected to the power network, so there is electricity for lighting and televisions. The traditional 2-story architecture keeps the buildings cool enough in the summers.





**Xu Xiaohong, Female, 21**

Having just given birth to her first child, she has only lived in the village for a year. She originally comes from another village four hours drive away, being an oldest in a family of four girls. Her family grew fruits, and saved enough for her to study. She was not good at it, so she gave the opportunity to a younger sibling, deciding to go to a big city to work. After years in Guangzhou, working unsuccessfully, as she could not learn the skills required for a barber, she met her husband and followed him to his home village, Xiaomi. Her husband is still working as a migrant worker in Guangzhou, but does not earn enough to support her there.



**Han Shushu, Male, 59**

Now living together with his wife, he was born in an even smaller village even farther up the mountains, an hour and a half's walk away. They moved to Xiaomi ten years ago because of the better roads and less derelict buildings. He used to work at his own fields growing fungus and rice, but now he has no field of his own, and gets income by growing bamboo shoots, hunting wild game on the mountains, as well as his children's support. His sons are working in Shanghai.



**Zhong Apo, Female, 92**

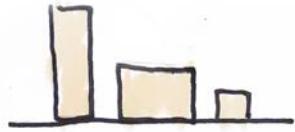
She has lived all her life in Xiaomi, working the rice fields, growing bamboo and sugar canes, then getting married to her husband from the other side of the village. Her children moved to Pucheng to work, and later to Shanghai, where her grandchildren live. Her children have since moved back to Pucheng, and come to see her regularly, as well as support her financially. She sometimes goes down to the town to attend weddings and funerals, taking a lift in a relative's car.



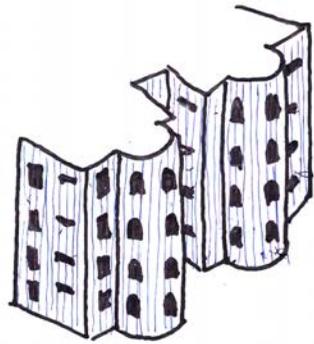
# SHANGHAI - Tongji New Village Solution



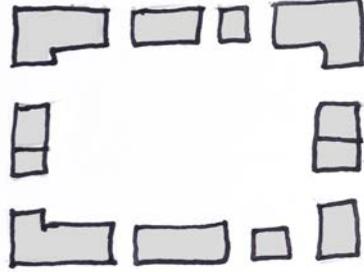
Paneling on surface prevents heating



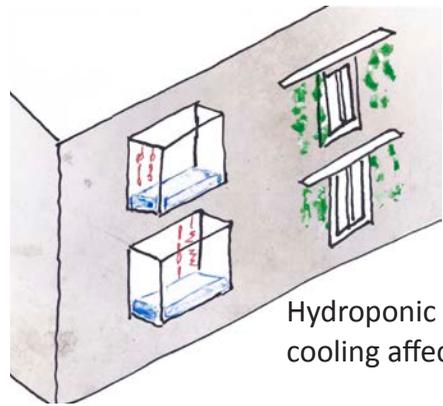
Building height for ventilation and sun



Building shape for ventilation

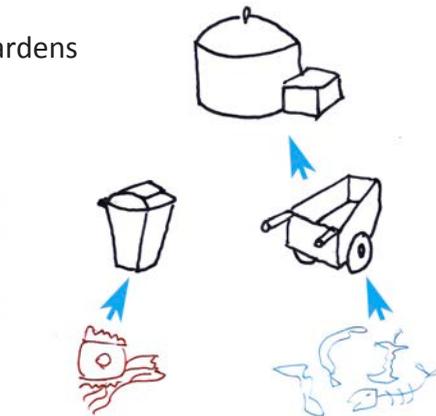
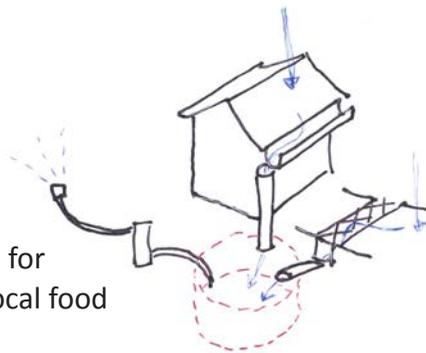


Small Communities



Hydroponic farming for cooling affect and local food

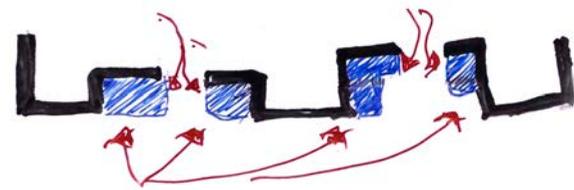
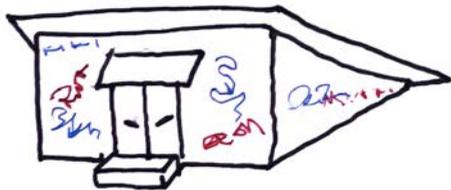
Rainwater collection and use for gardens



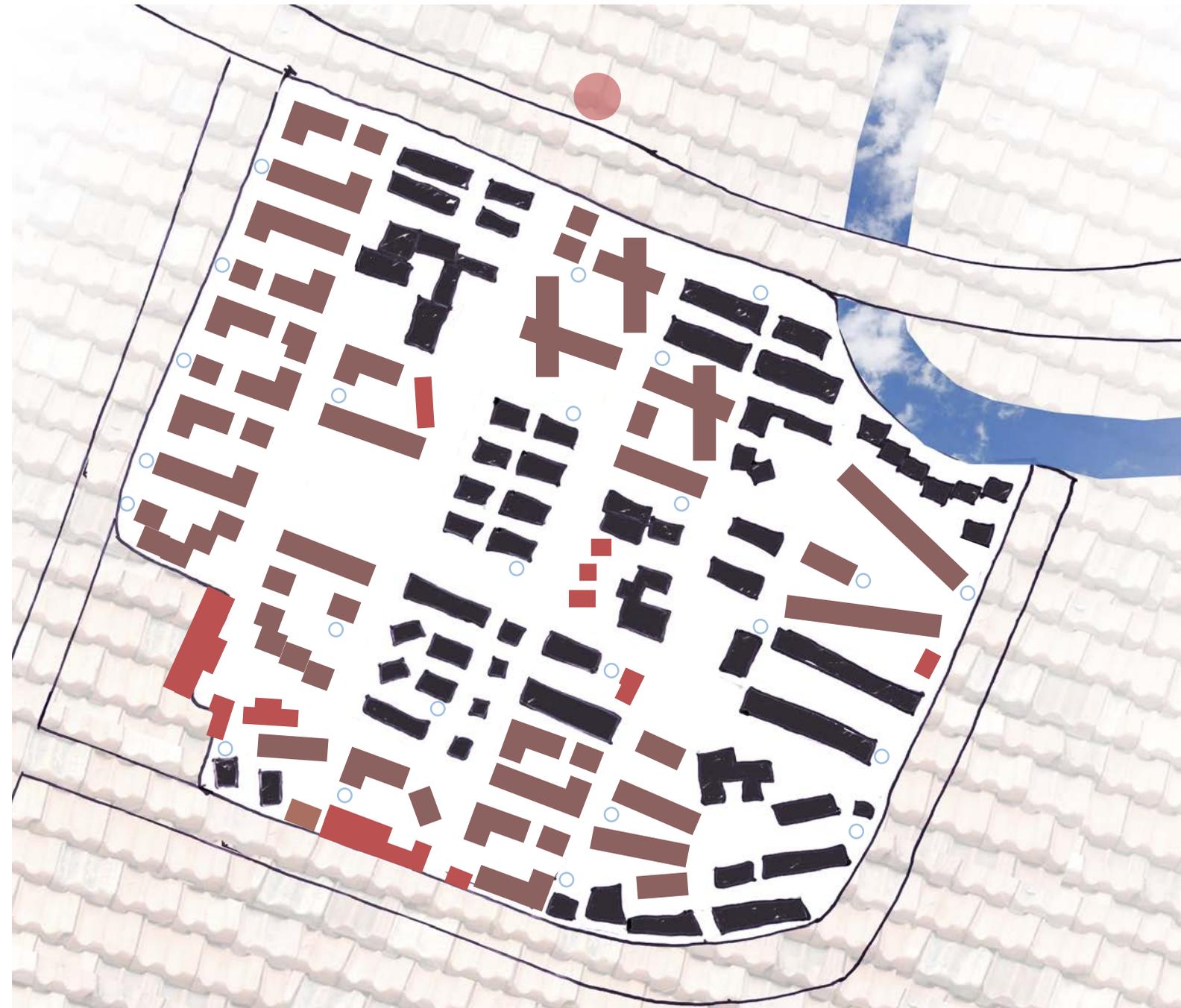
Bio waste into electricity in Fuel cell

External water for UV cleaning treatment

Underground hobby areas invite users



Entrance has cooperation spaces with outsiders



# SHANGHAI - Tongji New Village Solution



## Food & Plants

Even though most foods are bought, some fresh foods are always useful. Hydroponic systems outside the windows provide personal crops, but without the necessity to add water, as the system water cycle works by a pump.

## Water & waste water

Most Shanghainese drink tap water after boiling. As the chlorine content is high, it would be best to first stand the water for 24 hours, so that chlorine evaporates. Bacteria can be killed as effectively but without electricity by the UV rays in sunlight.

Every household can have a personal “water treatment” system.

Traditional buildings have a “window-balcony” outside the kitchen window. This is for hanging foods to dry in the wind, as some foods go bad if refrigerated directly. In these areas, a “water shelf” can be added, where water tap water is treated. If other parts are necessary, e.g. filters, they can be inside. The result is a tap that provides good-tasting, drinkable treated water.

As there are lots of garden, they occasionally also need watering. This water can be collected from the rainwater, from the roofs and pavements, then filtrated and stored in underground barrels. The water can be pumped up for watering uses.

## Waste

In the area, there are lots of senior citizens, as well as professors and teachers with families with little children. This types of families make food themselves at home, which results in a lot of bio waste. Even though there is a bio-waste container in the trash cans in the area, it is too hard to distinguish from the other cans, and no clear purpose to the collection.

A better idea would be to collect bio waste into wheel barrows, that can then be wheeled into a common container. The city is not convenient for large amounts of composting, but the bio waste could be processed in bio gas fuel cells into electricity, that can be used for lighting and other electricity needs. The Fuel Cell can be shared with neighboring communities.

## Temperature & Energy

The area is in the natural gas system of Shanghai, and thus reasonably cheap and ecologic. Water heaters can be added on roofs to provide more self-sustained heating in emergency situations. A bio mass fuel cell system can create the area’s own electricity.

## Buildings

The area will be rebuilt in the near future, as there is pressure to have more efficient and new high quality living in the area. Some old buildings could be reused, and the old concrete can be reused into the mix of the new concrete, especially the deep base structures where a lot of concrete is needed. The new buildings should have small windows and wood boarding or other material on surface, with

an air layer in between that insulates, so that heating and cooling costs are lower.

## Transport

Bicycle parking frames are needed, so that bikes won’t get stolen so often.

## Community

The new buildings form more clear semi-public spaces, own gardens, that share common trash cans and water container.

## Education & hobby, Aesthetic, comfort & culture

There are work, handicraft and research spaces at the entrance. Here small-scale selling can happen too, as well as the mixing of projects inside the area and people outside the area.

Inside the area, there are recreation spaces, such as dance and music spaces, as well as studying spaces. To attract more people, the could be underground and “suspiciously invisible”, to make the space more approachable.

There are various spaces inside the areas as well as at the entrance.

## Buying, selling, cooperation

A “Taobao center” near the security would make buying online easier: instead of waiting at home or work for the package to arrive, the guards can receive the package and leave it in the Taobao center. They can also help you send packages, so inhabitants can leave the package there, and don’t have to wait for the logistics guy to arrive. This would further encourage the use of internet age buying, selling, and product logistics.

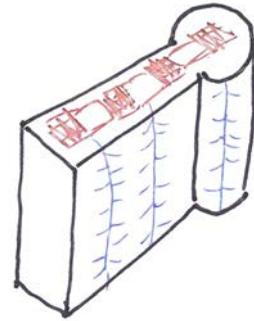


*Trashcans in Tongji area | Good bike stands  
A fruit stall in Tongji area | “Window balcony”  
The elevated road near Tongji area*

# SUZHOU - ZuoAn Apartments Solution



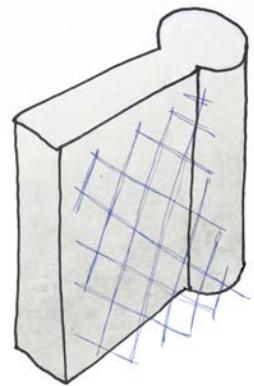
A building is turned into a vertical farm growing specialties



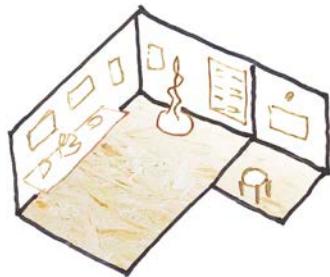
Rooftops have simple water treatment



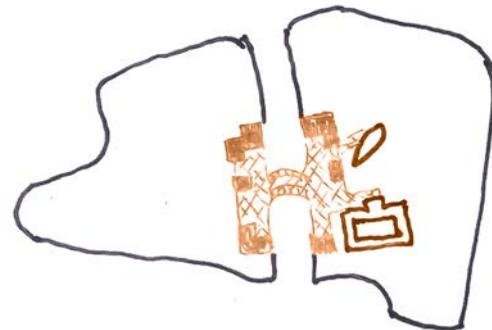
Buffer zones have community spaces



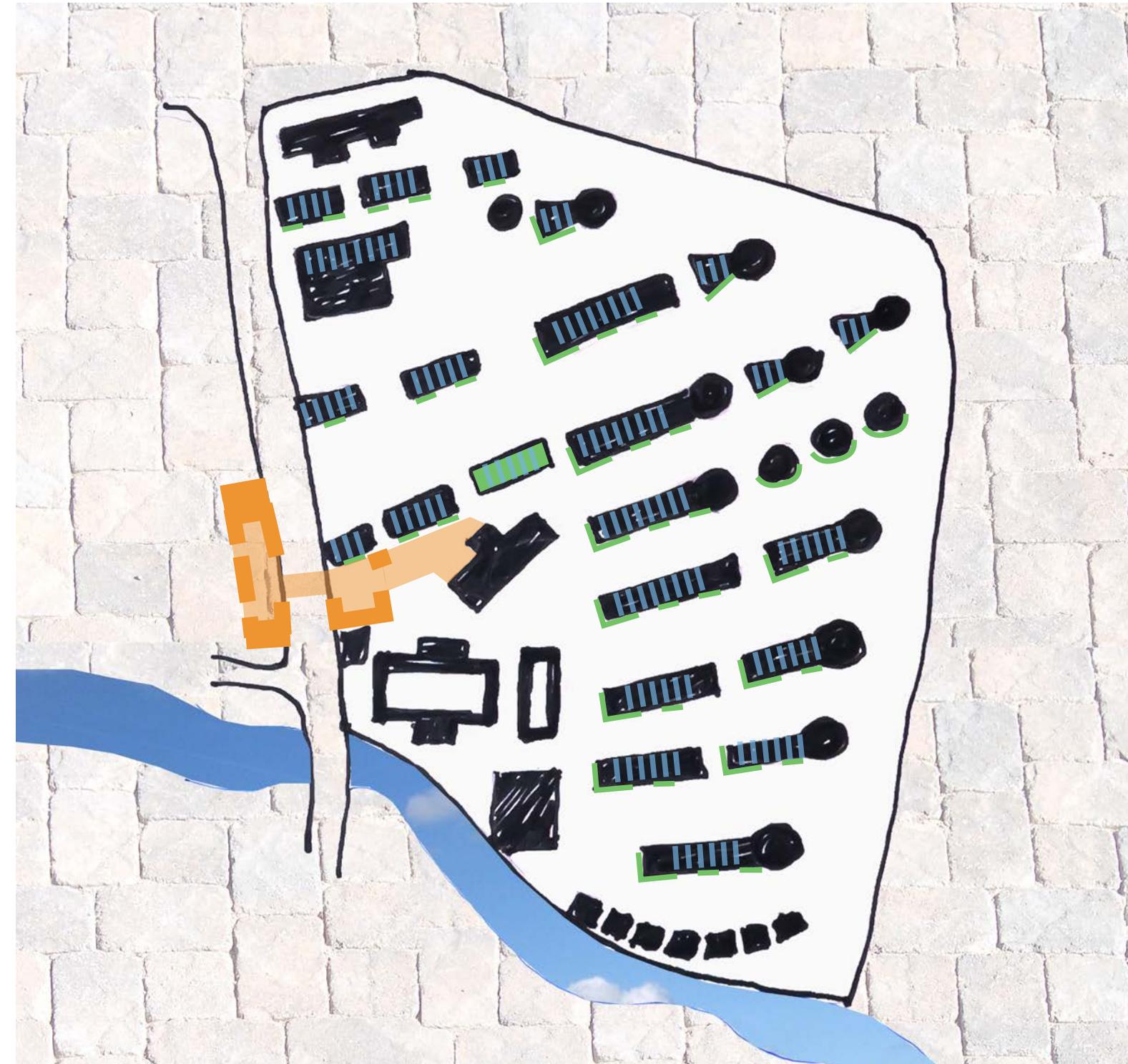
Buffer zones prevent excess heating



Video-advertisement rooms encourage co-operation



Shared services and hobby spaces with neighboring community



# SUZHOU - ZuoAn Apartments Solution



## Food & Plant

One building is turned into a vertical farm, that grows local vegetables and specialties that the partly foreign inhabitants wish for, e.g. Basil, parsley, olives. These can also be used in the foreign-food restaurants in the areas.

## Water & waste water

Most rich people buy their water. High-quality water can also be achieved locally, if have good system: every building can have a low-tech water treatment system on the roof, where tap water is filtered, left for a day, kept in sun for UV, and then comes down in the piping inside the buffer zone, connects as a separate tap into households, available for drinking.

## Waste

The waste water system is connected to the city network, and space is not enough for an own one. In rich or international areas, there is less bio waste and more packaging materials, managing bio waste is thus not necessary. Plastics, though, could be collected. They could be collected in the buffer zone and fed to plastic-eating mealworms. These worms could then be fed to the plants as nutrition, or sold as soil.

## Temperature & Energy

The windows are big and the façade is concrete – this makes the apartments hot in the summer and cold in the winter, thus the need for electrical heating is great. By adding a buffer zone to southern walls, a wooden

*Basil can be grown in vertical farms*

*Bicycles for renting*

*Mealworms consume plastic*

*A hydroponic, aesthetic plant solution for buffer areas*

frame with plants, this can be prevented. Instead of drying clothes in dryers, they could be hung on the buffer zone in the sun, at least the sheets. This is a traditional way of drying and sterilizing textiles in humid climates, and makes the clothes smell very good.

## Building

Add more small buildings or structures to better create enclosed, safe gardenlike spaces between apartment buildings

## Transport

A private community bicycle loaning center: There are many good bike roads in Suzhou, and Jinji is only 8 kilometers from the center. Buying a good bike requires effort, and in China, keeping it safe is even harder: carrying it to your apartment, triple-locking it everywhere. It's a waste of money, as it gets stolen sooner or later anyway. A "luxury bike rental" has quality kids bikes, tandem bikes, city and mountain bikes. These bikes have simple-to-use but high-safety locking systems to prevent stealing, and a GPS tracking system, so that bikes can be retrieved if stolen.

## Community

Buffer zones can have a small semi-public balcony for standing and growing plants. This is shared with the floor.

## Education & hobbies

As all the people in this block are pretty similar, what

they need is activities with other people. The block has a shared "activity area" with the western block, with 1-2 story buildings including sports space, music and recreation spaces, work and handicraft spaces, according to what people want and organize. They can also include cafes, minimarkets and restaurants. There are locked storage spaces available, so people can get, bring and share their own equipment. Some spaces can be assigned to groups, who are responsible for the activities and cleanliness. The area integrates to the existing yoga center and restaurant complex, bringing more liveliness and customers to the areas.

## Aesthetic, comfort and culture

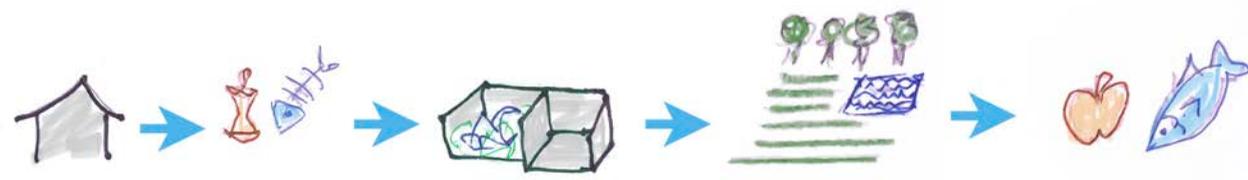
In these activity spaces, they can also create art and events for the two areas.

## Buying, selling, cooperation

There can be one room, a "digital advertising" room, where there are short fun video-adverts of local people, their projects and skills are advertised, as well as products are shown. This way, other people can use their services/products, or join their community. This can work well for stay-at-home mums to sell some fruits of their clay-modeling hobby, or a way to advert consulting services, or a student to search for an English learning partner. There is a small room where the video can be made, if one has no own camera, and a computer to add it to the system.



# PUCHENG - Shuinan Solution



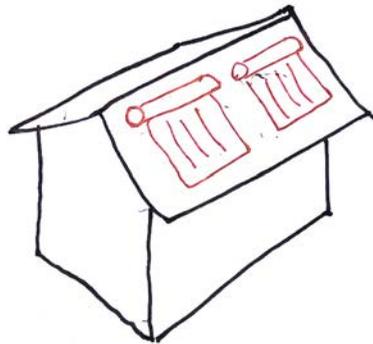
Composting waste and using it the soil on the fields

Community members host services and hobby spaces



Hosted services have signs or special doors to enable use also for other townspeople

Solar heating brings security to heating



Added empty spaces create better ventilation, a second story is added



# PUCHENG - Shuinan Solution



## Plant & Food

There are already fields outside. A lot of the produce, for example the fish, are sold to other areas in order for extra income. Even more specialization could be done, if own food is not an issue.

## Water & waste water

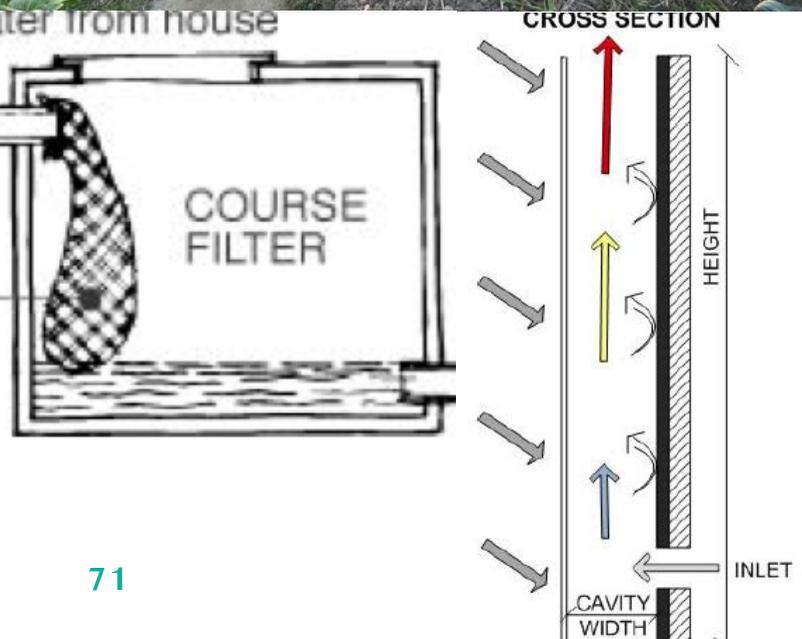
Almost all the space in the area is hard, thus water is not absorbed. The roofs have collectors and pipes, that lead the water to tanks near the fields where it can be used. A simple filter can be used between the pipe and tank, for example a cloth.

## Waste

There is lots of bio waste in the block; most of it is just thrown on the streets or in the trash. It can be collected in "street-wheelbarrows", and taken to a central compost area by the fields.

## Temperature & Building

The problem in the area is the humidity. Low, densely built areas receive little sunshine or wind, and thus moisture destroys structures and creates molds. By strategically removing some houses, and making other houses higher to keep the same amount of space. The typology of other 2-3 floor houses in the areas is used. In higher buildings, the highest room gets especially heated. In these cases a buffer-surface of boarding or plants or buffer space such as balcony **can be added**.



- New cars in a shop in Pucheng*
- A nearby field*
- A simple filtering system for rainwater collection*
- A solar chimney for ventilation*

Also a high solar "solar chimney" for increased ventilation can help. Windows should be kept plenty but small. Growing plants on the roof is an option for flat-roofed buildings.

## Transport

In this area, there is no space for cars, and most people don't own them either. A car is very convenient in these areas, especially for transporting a group of people or objects, with little public transport outside the main city. Most use motorcycles which have their limits.

A car-sharing project can solve the problem, by renting cars to the inhabitants when needed. A car park area could be placed near the entrance, and protected by a wall. To avoid having lots of inexperienced drivers crashing cars, the cars could be divided into old and new cars, with the older ones available to newbies for a cheaper rent, renting newer cars requires practice or maybe a test. As the people all know each other, and are thus liable if the car is not returned, this system could work.

## Community, Education & hobby, Buying, selling, cooperation

The community is already very strong, but there are too few semi-public spaces. Now these spaces have formed into people's yards and first-floors, where people meet, store and sell things, fix bikes and objects, make wooden furniture, cooking breakfast for others,

and so on. These social places could be brought more open, more clearly a semi-public space. People could host their own "service-room" attached to the house, providing the services they want, e.g. wifi and computers, small storage room, space with music and mirrors, etc. The service could be marked with a special door and entrance, as well as a sign on the wall. This could open the services available to people from the city, that are not familiar with the Shuinan area – at the moment, they hear of it from someone, and then come and ask directions. In these spaces, hobbies, education and working can happen.

## Aesthetic, comfort and culture

In this area, many people are interested in history and art, but do not necessarily have the skills. Their children, that live in other cities as students or migrate workers, could help in this area. Inhabitants should involve their relatives that are capable, for example for designing the entrances and spaces of hosted service spaces. These relatives might even involve friends in their own environment, e.g. in Guangzhou and Shanghai, such creating diverse and possibly even quality solutions. Also in other cases where information or talent is needed, the networks to big cities can be used.

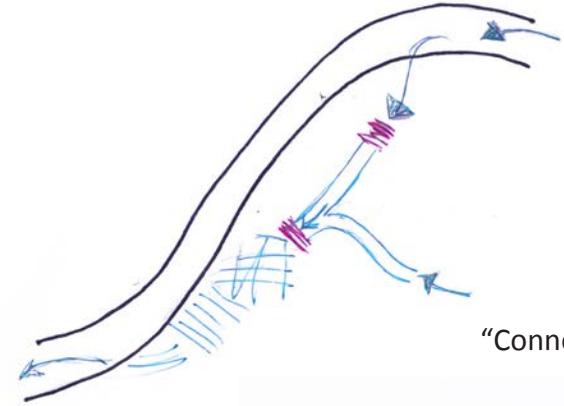
Growing special foods for markets of cities.  
 Growing special foods in empty buildings.  
 Using permaculture to farm some products ecologically



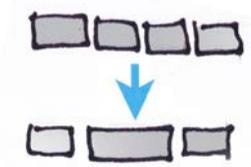
# XIAOMI Solution

A water treatment solution for the waste water coming from village trenches

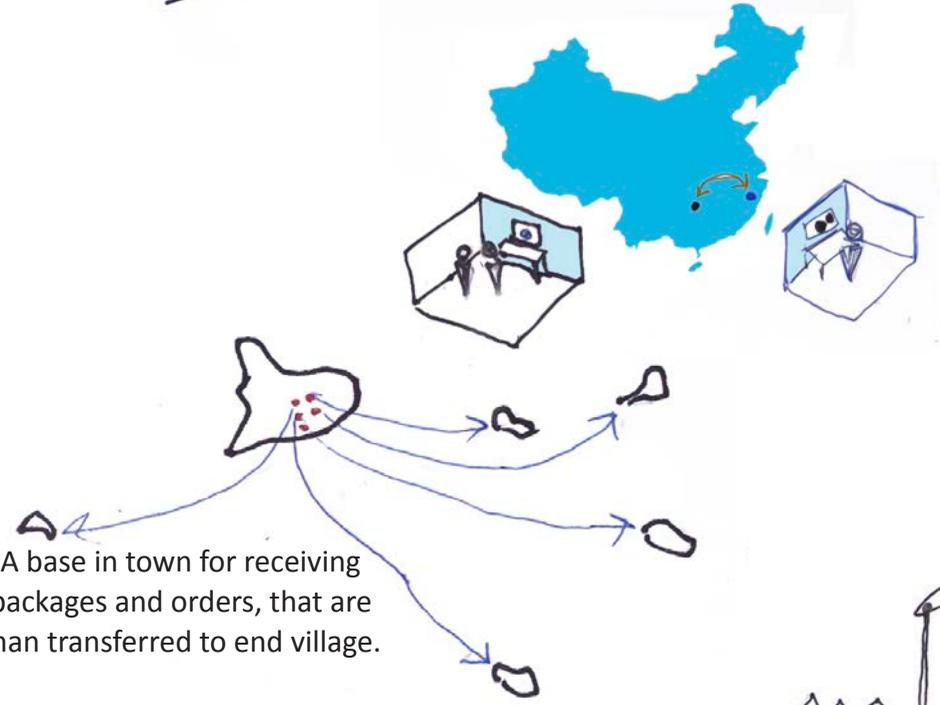
A pre-cleaning treatment for washing clothes



Combining empty buildings for new uses

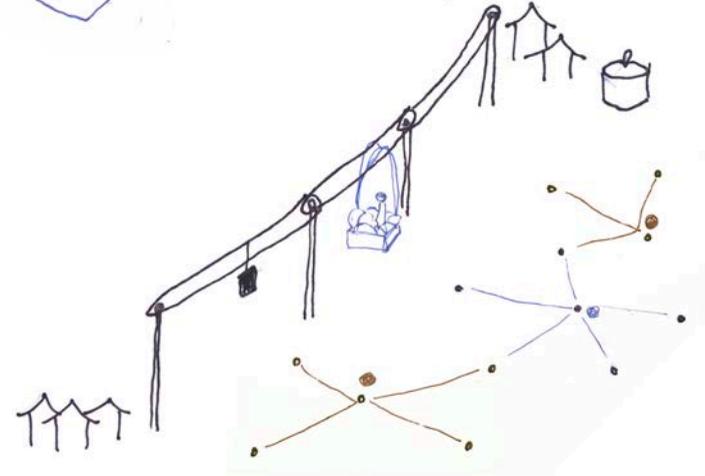


"Connection room" for learning, co-operation projects and connecting with relatives



A base in town for receiving packages and orders, that are then transferred to end village.

A person and freight transportation system for sharing services with other villages



# XIAOMI Solution

## Plants and Food

The village can specialize in crops wanted also in bigger cities, such as gourmet foods, diet foods, popular health foods, ecological foods etc. To create ecological foods, if insects and nutrition are an issue, permaculture techniques can be used.

## Water & waste water

Waste water treatment is needed. The existing waste water trenches could lead to a treatment area, with sand and wetland, before returning the water to the river. There could be a second, man-made river for washing clothes and vegetables, that can be turned on and off. It would take lead river water through a simple filtering system, and after washing the water would continue to the sand and wetland system. If everyone did this, including factories, the river would be much cleaner, and foods washed in the river become less health hazards, too.

## Waste

With close villages, rich villages and village groups with good transportation, shared incinerators can be used. Most of the waste is bio waste, that can be composted and used for the crops. Toilets are an issue – more dry toilets could be used, also separating toilets (with separate paths for urine and feces) can work, with feces composted for 2 years together with leaves, and urine passing the water treatment, then going to the river.

*Villagers washing vegetablese in the river*  
*The beach is a dump*  
*Waste water trenches in the village*

## Temperature and Energy

Use solar heating on roofs, if have the funds. Most people boil their washing water, or just use cold, or just don't wash. The water pre-treated for washing clothes and vegetables could also be collected in buckets and used for washing people. Simple bucket-showers can be implemented.

## Building

Use traditional techniques of second floor as buffer zone to keep lower floor cool.

## Transport

Now villagers use motorbikes to go to town or visit relatives in other villages. Road has no up-keep, gas is expensive, and motorbikes get broken. Also amount of stuff on it is limited. Many villages are practically unreachable by cars. A cheap, efficient system is required, to help villages share tasks of waste management and energy production. An example could be a cable system on poles, that would rely for energy on counterweights, this would work in mountainous areas.

## Community

At the moment, some village communities become a bit depressed, as all talented and young people leave, leaving behind the olds sick and stupid. This passive attitude should be changed! Villages should govern

themselves, have visions, improve the living environment and thus be a possible opportunity for returning people, as is now in some villages with better connections or work opportunities. In the recent years, Internet connections have improved substantially, but most villagers don't have pads or computers to use them, or know that they could be useful for remote working and learning.

## Education & hobby

There are empty buildings, that could be formed into larger entities and used for livestock, mushrooms, or other sellable value creation.

## Aesthetic, comfort and culture

Share temples with other villages. Also have cooperation with relatives and friends outside the village, involve them in improving the village.

## Buying, selling, cooperation

It is hard to buy online products, as there is no logistic network. Villages could have a "representative office" in the city, where the ordered goods are taken, and the weekly taxi-van, post-van, or motor bikers can take them to their final destination. This could encourage own projects, as it would be possible to gain materials and objects into the village.



# DISCUSSION

Visiones are futures for the heart. Something that lets the people put themselves for a larger purpose. We NEED more visions now.

- Peter Bishop



## Implementation

Now that sustainable solutions start to exist in huge quantities and varieties, they need to be implemented more rigorously in more situations, not only in high-profile high-budget instances.

Education of urban planners, politicians and inhabitants is needed. Also more measurable data on the benefits is need, such as how it affects health and economy.

Favorable policies and political discussion is needed, as well as finding more ways to involve the community in planning and choosing solutions. Using fun and entertainment is a good way to involve and educate people - this is easier as digital instruments are becoming prevalent even in poor areas.

Sustainable information and consultation should be available to planners around the world in affordable prices, so that for example planners from towns or villages could go to a "sustainability counselor", that helps provide detailed solutions and instructions to them.

## Future research

By this overview, I hope the reader has gained many ideas on what kind of researches are needed. Examples could be, how to conserve humankind on an unpredictable planet and prepare for crisis conditions, as well as detailed solutions in using the biosphere to our advantage. More research on understanding networks and function distribution is also in place, especially in how to create robust systems that do not crumble in crisis periods.

## Limits of the Study

The goal of this study was to act as an overview and introduction to planning sustainable urban spaces. It is not exhaustive. The history of sustainability has not been reviewed thoroughly, nor have other network and distribution solutions used in urban planning.

The study of the areas is largely based on personal interviews and discussions with the inhabitants, as well as observing their life and comparing elements to other cities and villages in China. Before implementing any solutions, a much more careful study should be conducted.



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