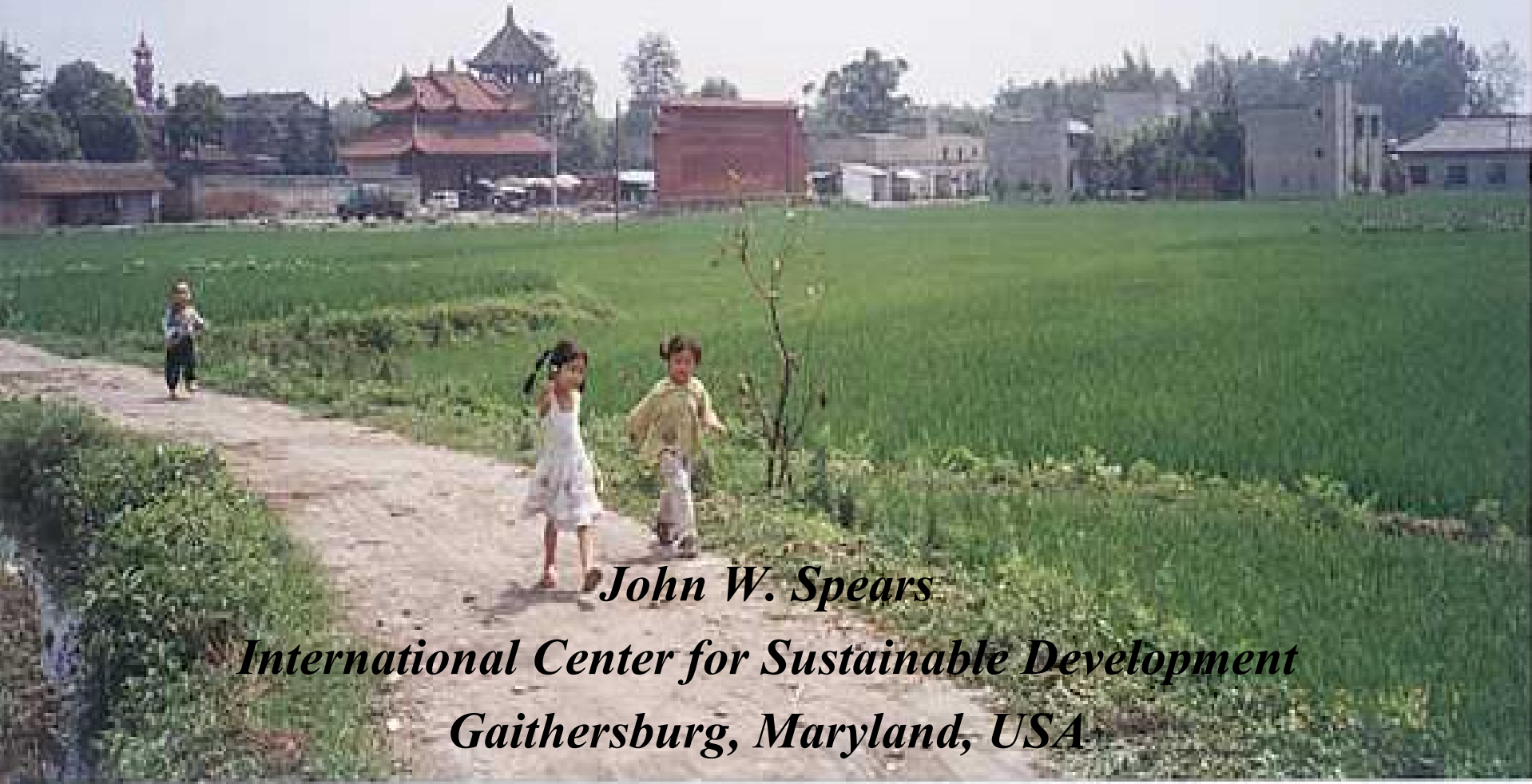
Longju Model Sustainable Village
Guanghan, China



John W. Spears
International Center for Sustainable Development
Gaithersburg, Maryland, USA

China
Longjo Model
Sustainable Village
RUSSIA
KAZAKHSTAN
MONGOLIA
KYRGYZSTAN
UZB.
TURKM.
TAJ.
AFGHANISTAN
PAKISTAN
INDIA
NEPAL
BHUTAN
BANG.
MYANMAR (BURMA)
LAOS
VIETNAM
NORTH KOREA
SOUTH KOREA
JAPAN
TAIWAN
Sea of Japan
Yellow Sea
East China Sea
PACIFIC OCEAN
Bay of Bengal
Lake Baikal
Amur
Tien Shan
Tarim Basin
Kunlun Shan
Gobi
Himalayas
Yangtze
Yellow
Xi
K2
28,251 ft.
(8,611 m)
Mt. Everest
29,029 ft.
(8,848 m)
Tropic of Cancer
40° N
20° N
80° E
100° E
120° E
0 250 Miles
0 250 Kilometers
Heihe
Hailar
Qiqihar
Harbin
Changchun
Jilin
Shenyang
Altay
Tacheng
Ürümqi
Shache
Anxi
Da Qaidam
Baotou
Hohhot
Beijing
Dalian
Tianjin
Yinchuan
Shijiazhuang
Taiyuan
Xining
Lanzhou
Jinan
Qingdao
Zhengzhou
Xi'an
Nanjing
Shanghai
Suzhou
Ningbo
Hangzhou
Wuhan
Chengdu
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Lhasa
Nanchang
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Guiyang
Fuzhou
Kunming
Guilin
Xiamen
Guangzhou
Nanning
Macau
Hong Kong
Haikou
Hainan
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Guanghan is a sustainable energy demonstration city for APEC's Energy for Sustainable Communities Program

- March 1999, Guanghan officials asked APEC for help to design a model sustainable village
- February 2000 Village design charrette in Golden, Colorado
- August 2000 Eight-person US team visits Guanghan
- September 2000-March 2001 US team developed recommendations report
- June 2001 a five- person US design team returned to Guanghan
- November 2001, The US design team will return to present a full schematic design of the Model Sustainable Village

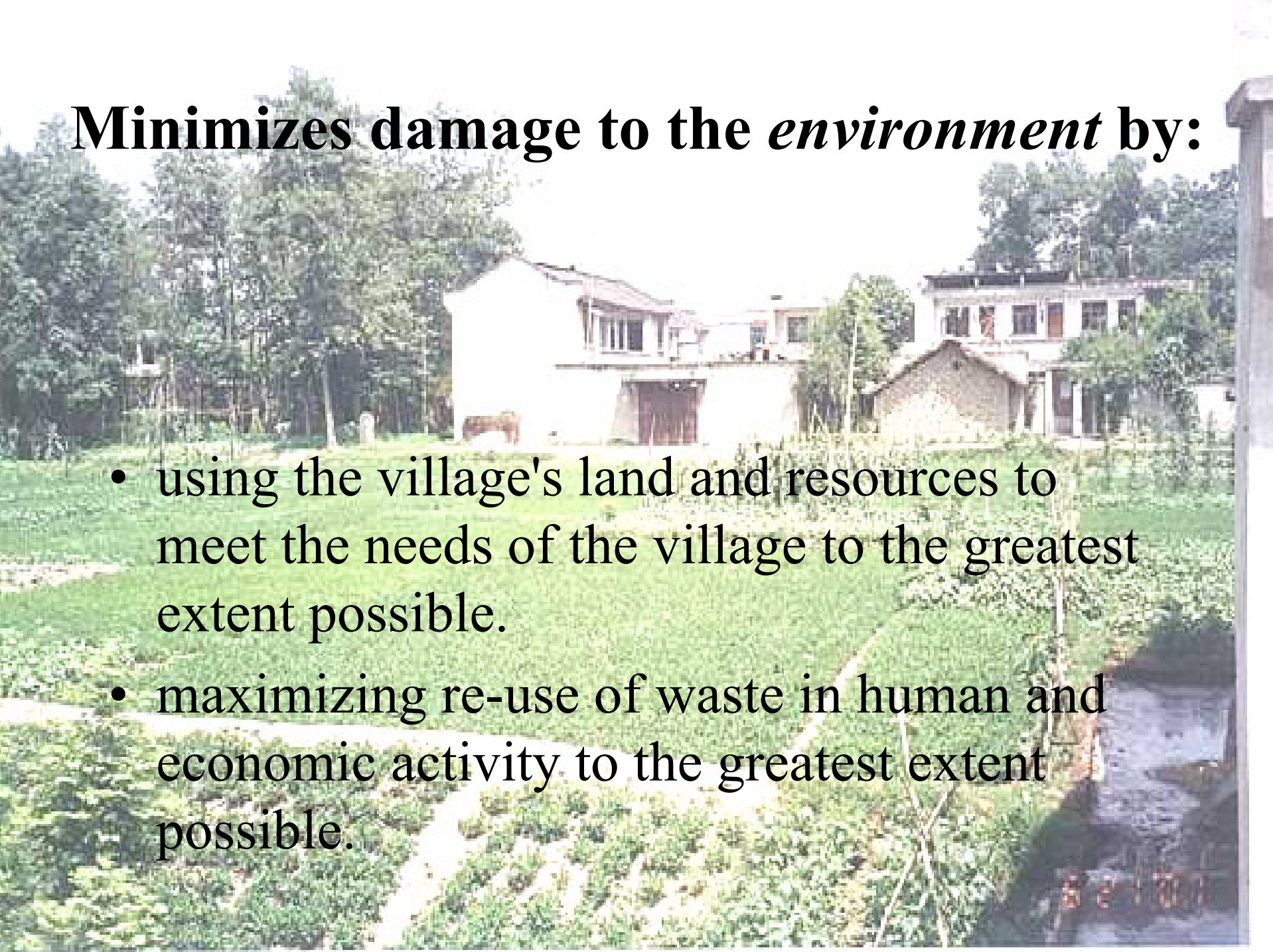
Sustainable Village Design Team

The goals of design of the Model Sustainable Village are:

- to promote economic growth
- to protect the environment
- to foster a strong community
- to improve the quality of life

Promotes sustainable *economic growth by:*

- strengthening the physical infrastructure of traditional agriculture.
- creating new industries in the village.
- creating a site plan for homes and shops that promotes economic and social interaction.
- using advances in technology to integrate the infrastructure of the village (energy, water, transport, and communications) to the greatest extent possible.



Minimizes damage to the *environment* by:

- using the village's land and resources to meet the needs of the village to the greatest extent possible.
- maximizing re-use of waste in human and economic activity to the greatest extent possible.

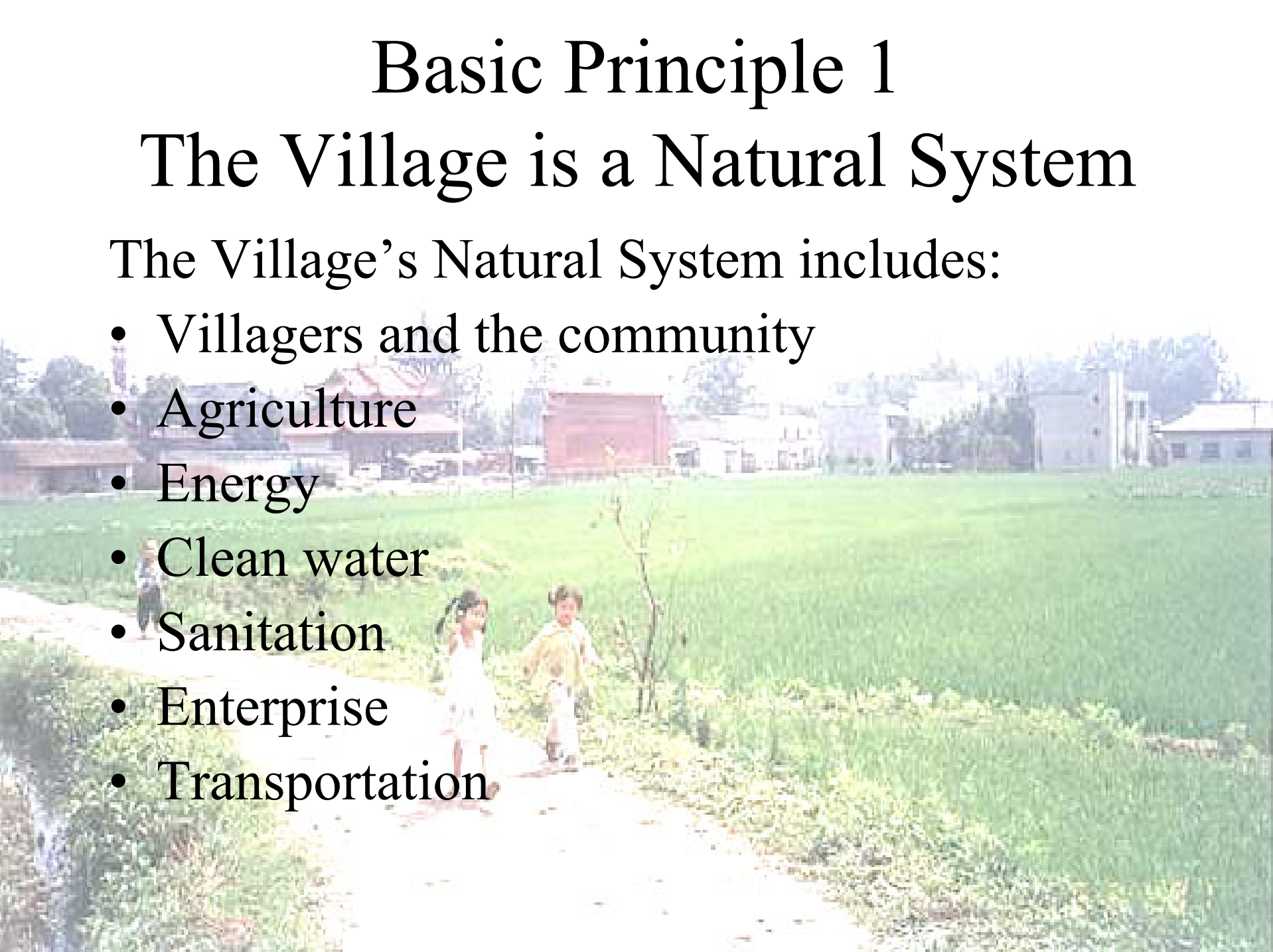
Fosters a *community*, emphasizing individual needs by:

- allowing maximum flexibility for individual choice in living conditions.
- building a "community center" in the center of the village that promotes the personal interaction of village residents.
- taking account of the village's cultural heritage in designing the village.
- using advances in internet technology to promote the village's cultural heritage.

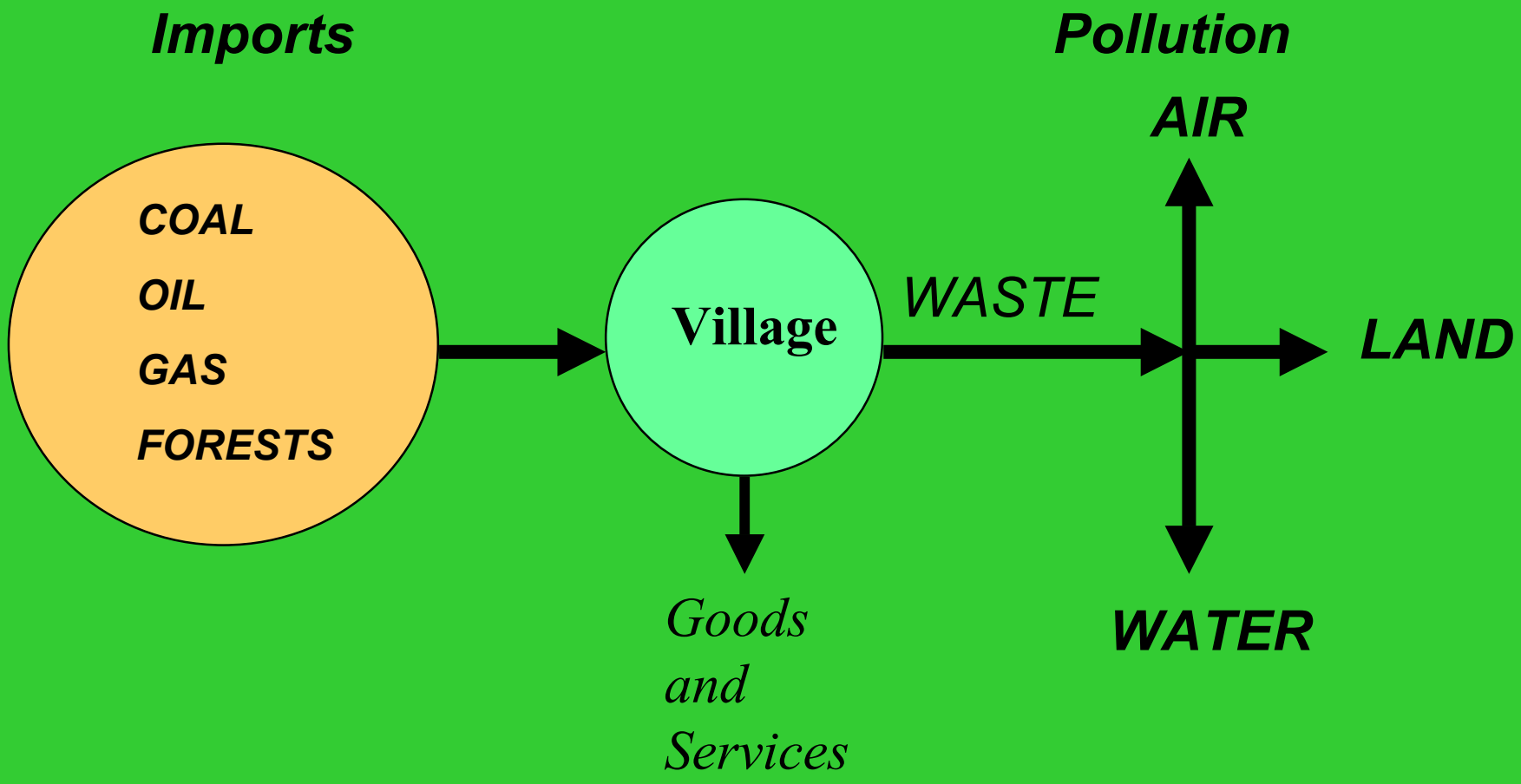
Basic Principle 1
The Village is a Natural System

The Village's Natural System includes:

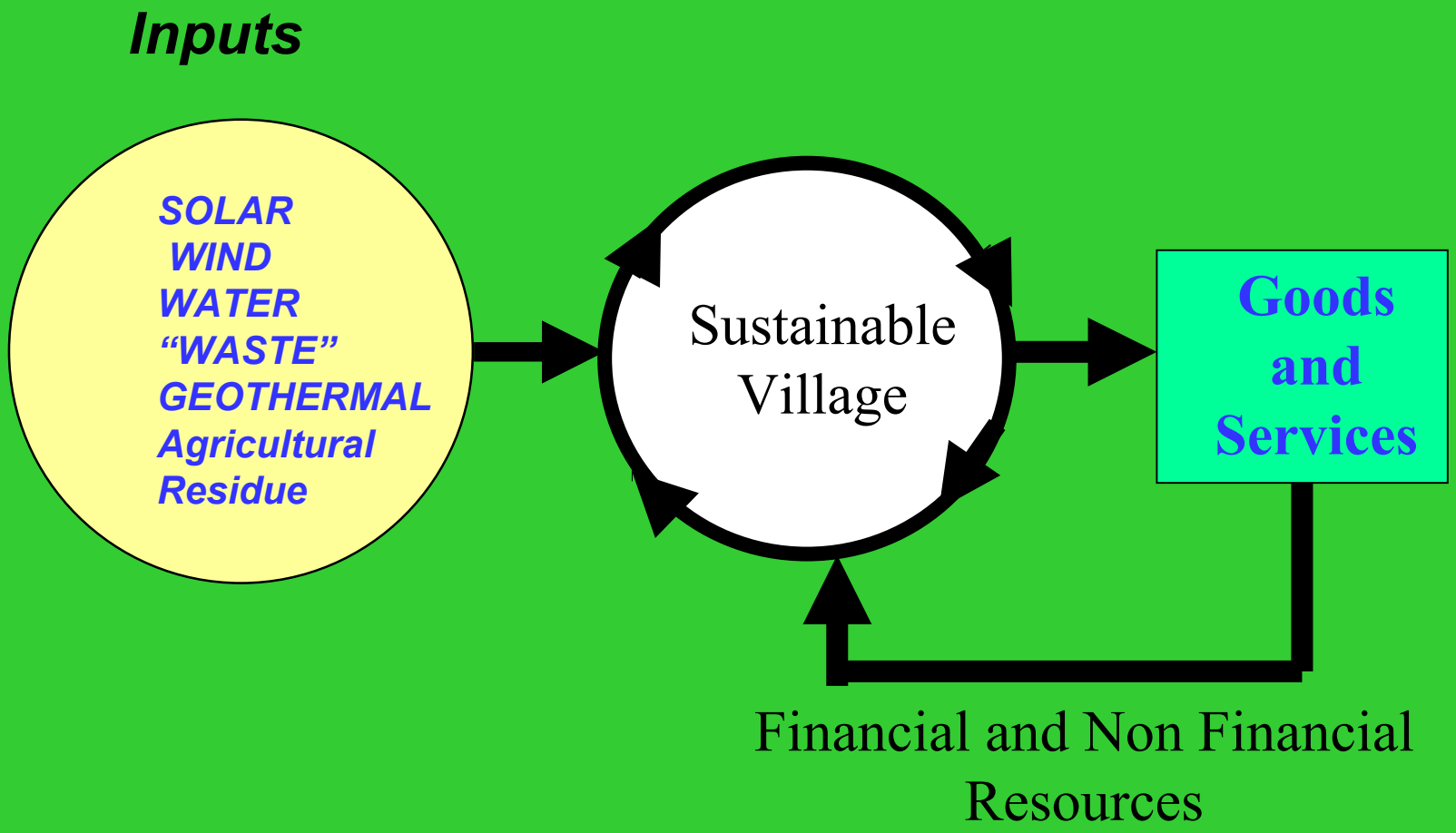
- Villagers and the community
- Agriculture
- Energy
- Clean water
- Sanitation
- Enterprise
- Transportation



Non-Sustainable System



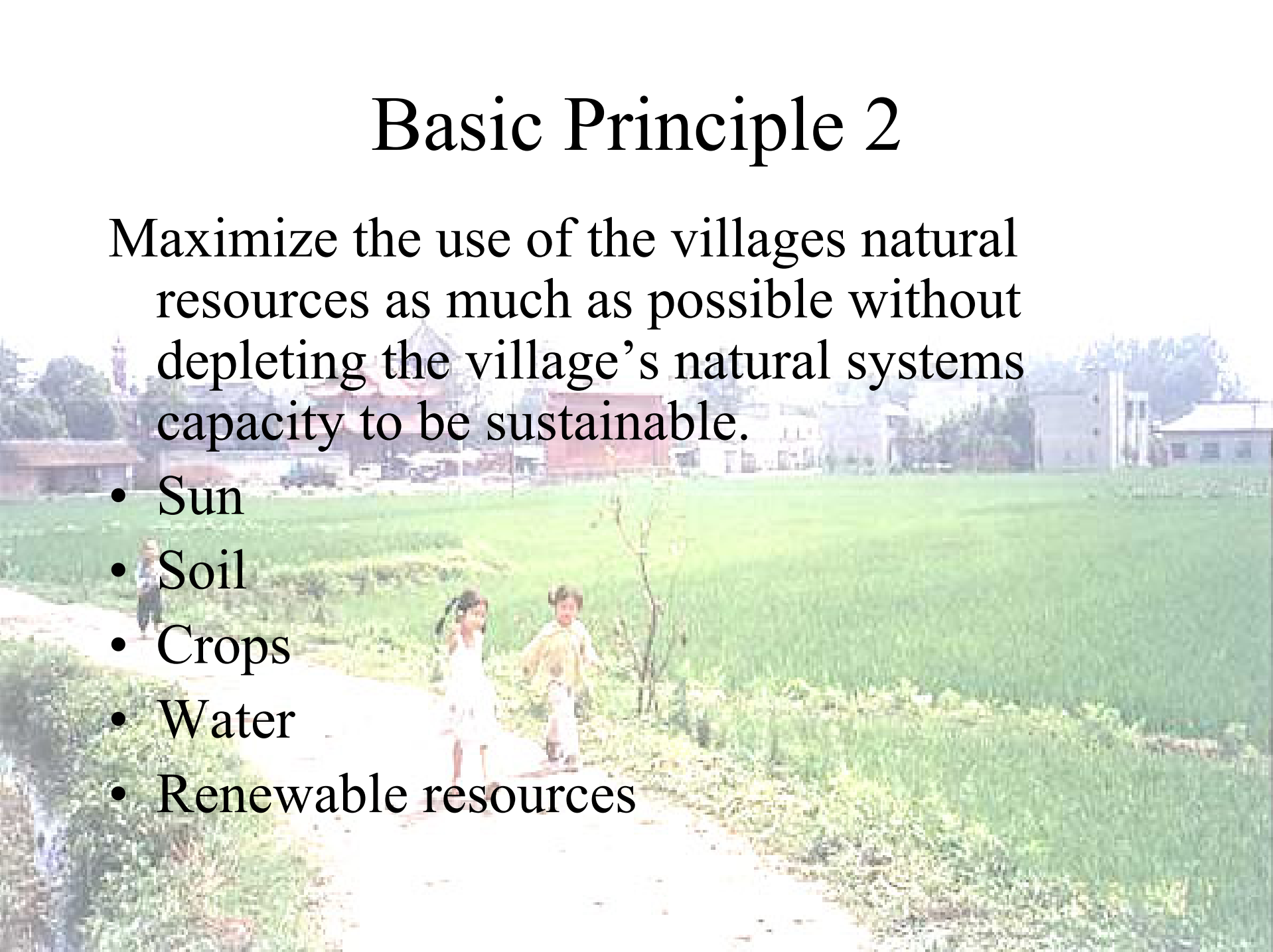
Sustainable Village System



Basic Principle 2

Maximize the use of the villages natural resources as much as possible without depleting the village's natural systems capacity to be sustainable.

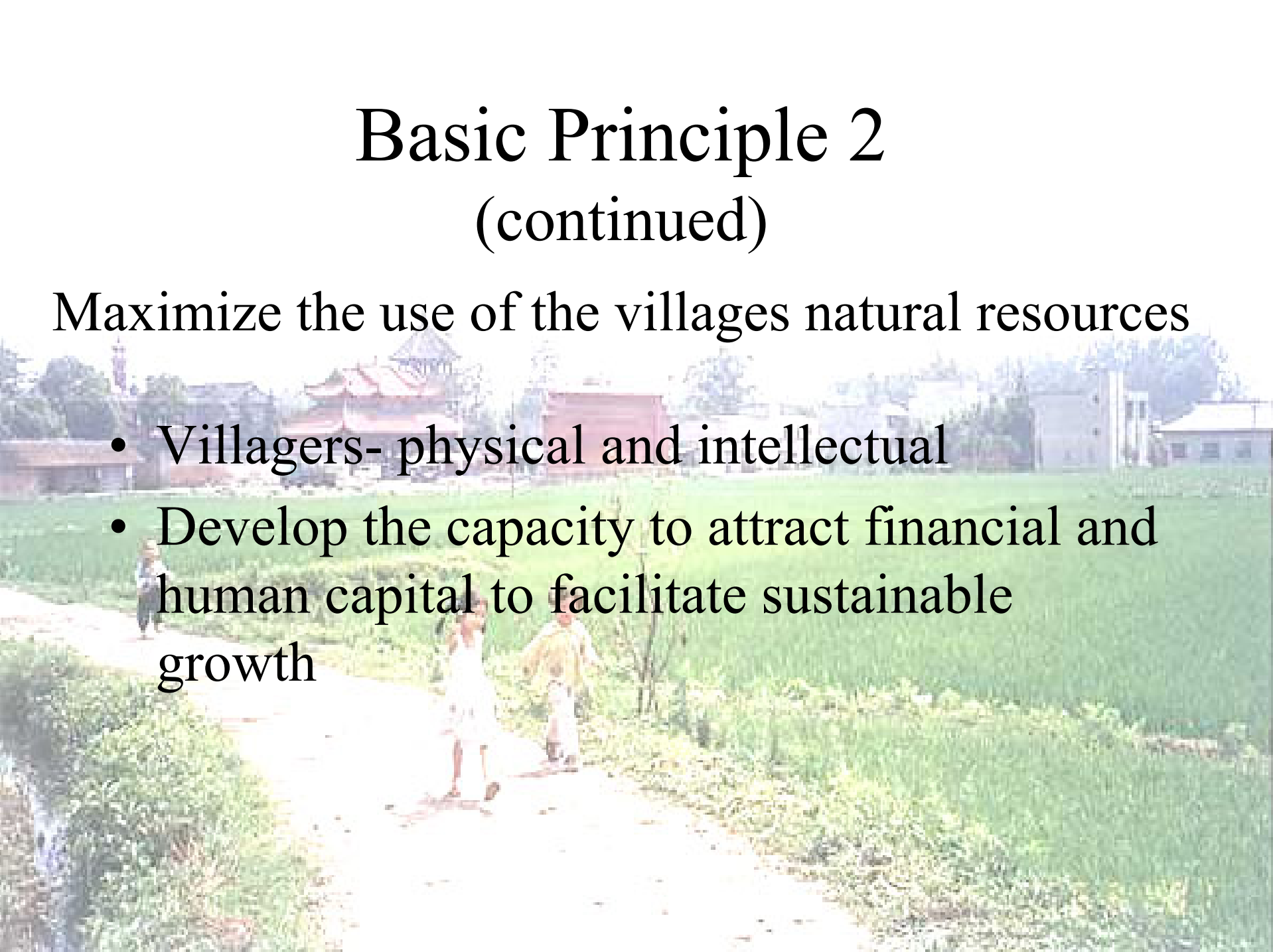
- Sun
- Soil
- Crops
- Water
- Renewable resources



Basic Principle 2
(continued)

Maximize the use of the villages natural resources

- Villagers- physical and intellectual
- Develop the capacity to attract financial and human capital to facilitate sustainable growth



Basic Principle 3

Protect all natural living systems

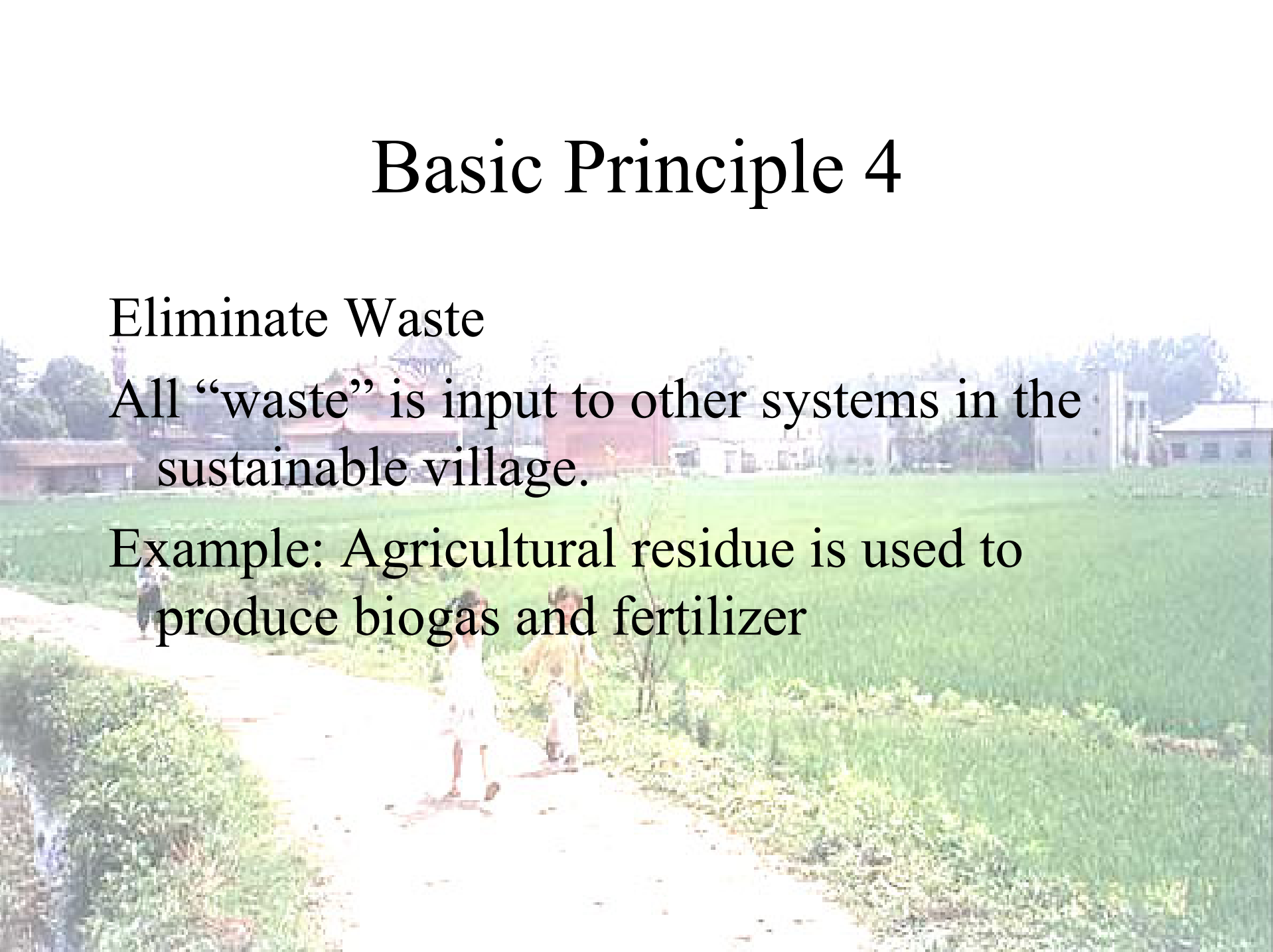
- Don’t pollute the water, air and soil
- Use organic friendly methods

Basic Principle 4

Eliminate Waste

All “waste” is input to other systems in the sustainable village.

Example: Agricultural residue is used to produce biogas and fertilizer



Basic Principle 5

Improve the efficiency of all systems in the sustainable village

- Agricultural productivity
- Energy efficiency
- Human productivity
- Resource utilization

Basic Principle 6

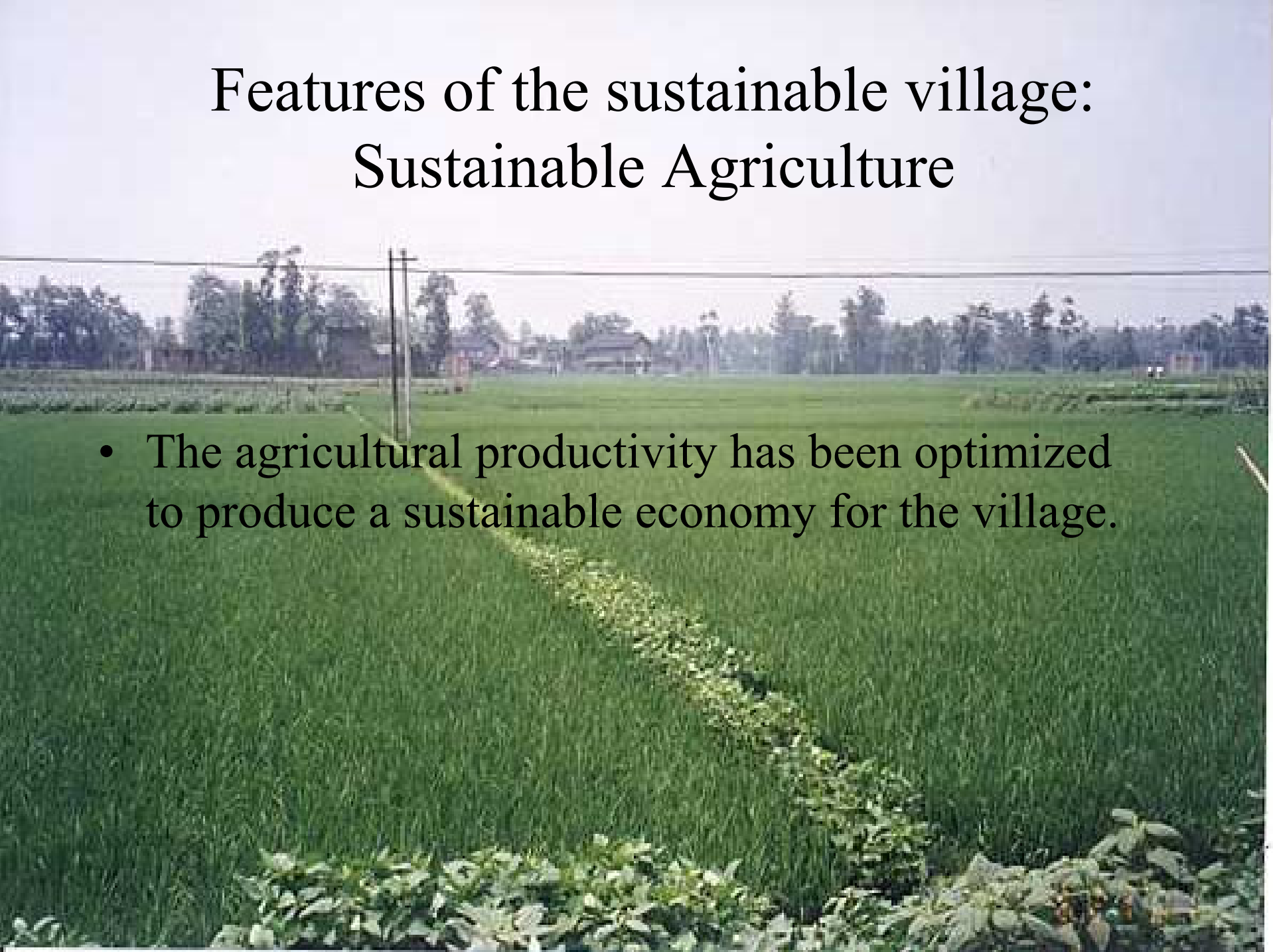
Establish community organizations to operate and manage the sustainable village for the benefit of ALL villagers

Longju Model Sustainable Village Design Features

- Site Plan
  - **Minimum new road construction**
  - **Optimize land allocation for housing, agriculture, commerce, micro enterprise and community**
  - **Promenade along the water front with housing and shops**
  - **Supports tourists to the village , tea houses and Longju Temple**
- **Sustainable Principle**
  - **Efficient use of natural resources**


40 m

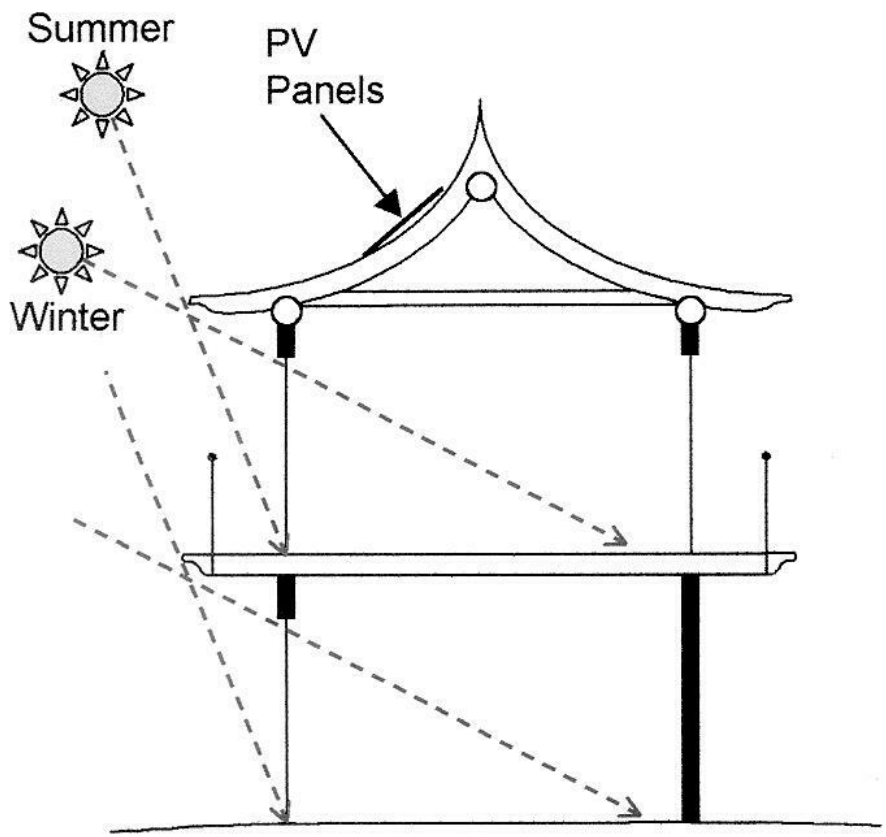
Features of the sustainable village: Sustainable Agriculture



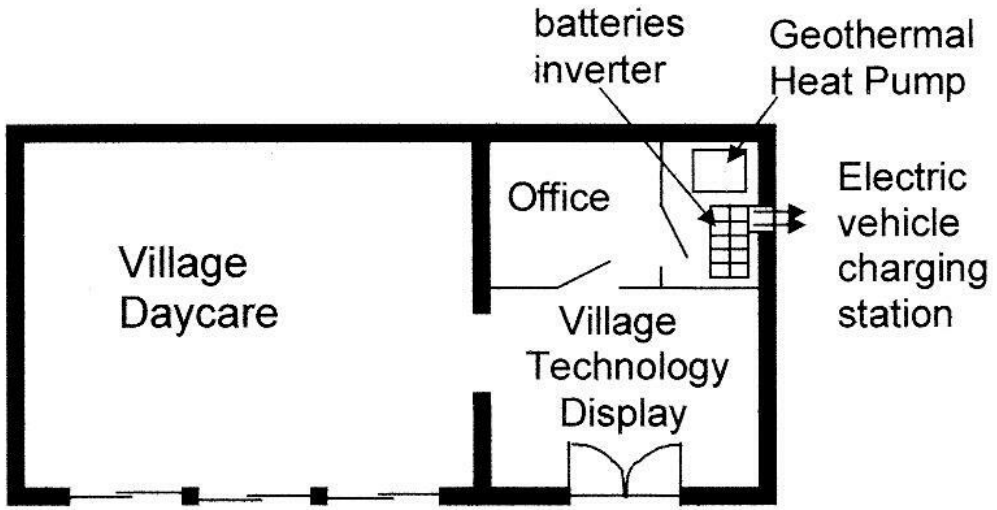
- The agricultural productivity has been optimized to produce a sustainable economy for the village.

Longju Model Sustainable Village Design Features

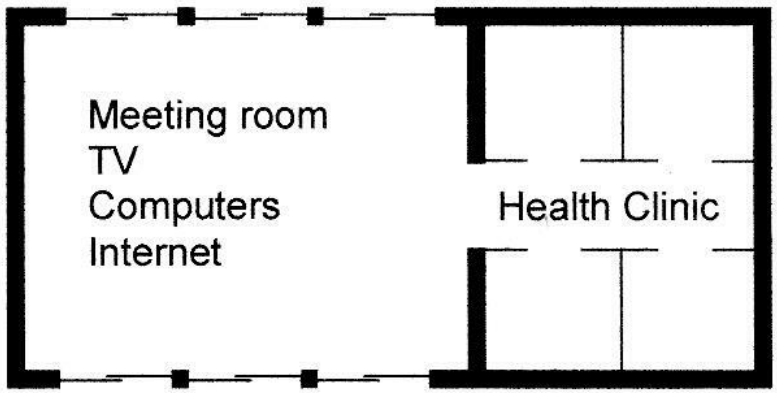
- **Community Center**
  - **Clinic**
  - **Telephone and internet -Green Star**
  - **Kindergarten**
  - **Cultural center**
  - **Office for village committee**
  - **New technology demonstration**
    - **Geothermal heat pump**
    - **Solar PV**
    - **exhibits on village systems such as biogas, fuel cell, solar**
- **Sustainable Principle**
  - **Establish community organizations for the benefit of all villagers**



Guanghan Community Center



First Floor

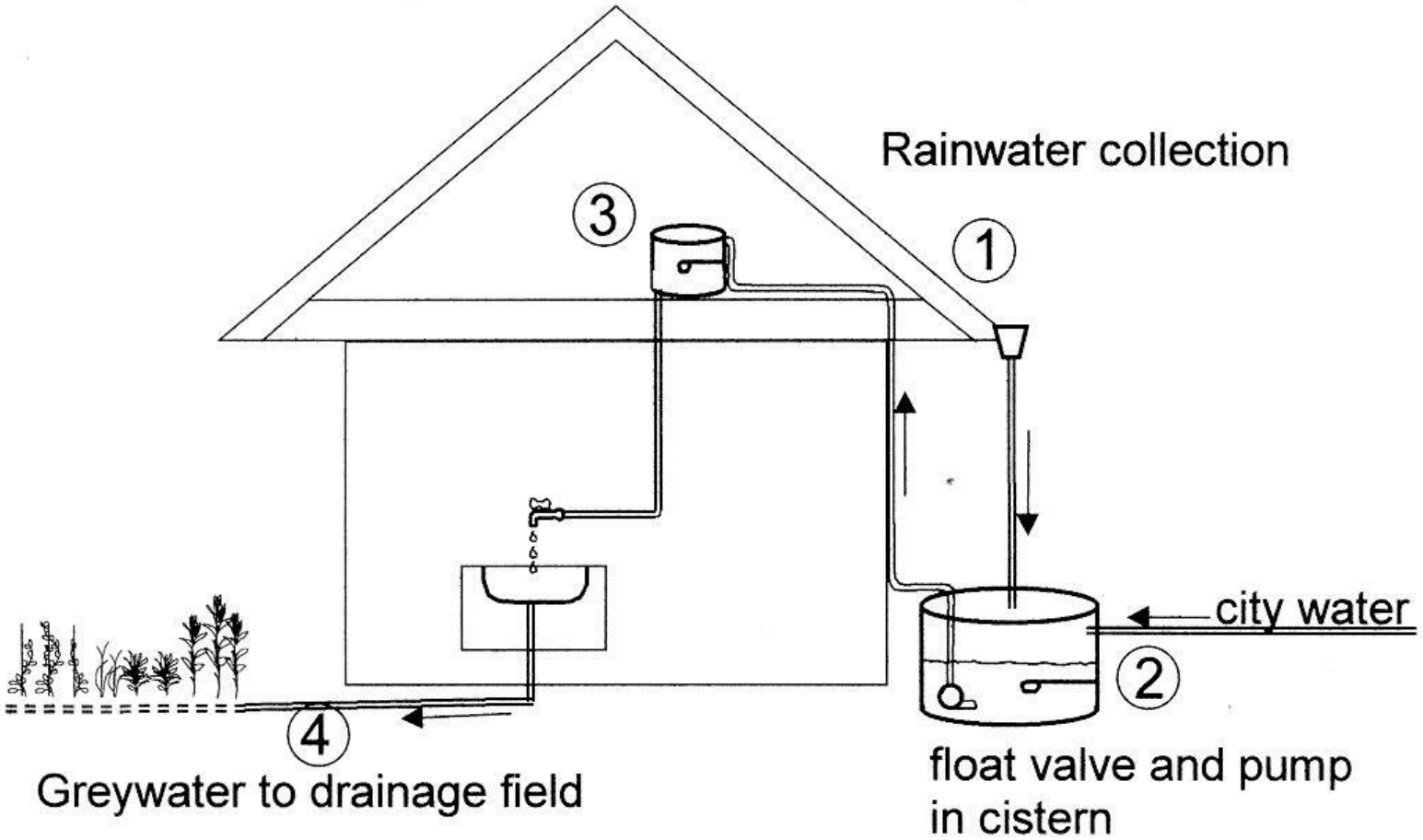


Second Floor

Longju Model Sustainable Village Design Features

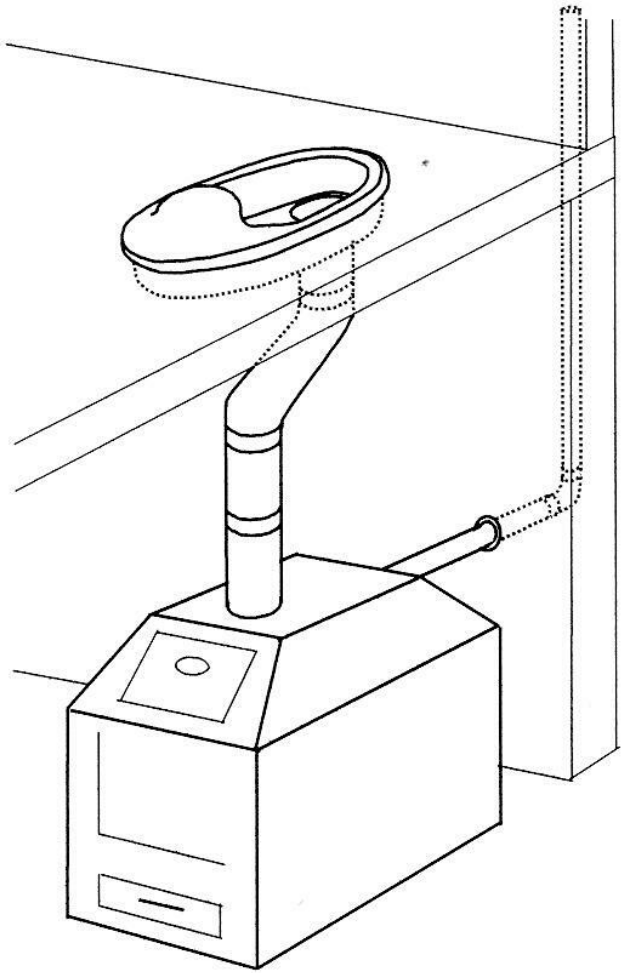
- **Village Systems**
  - **Water-Rain water collection with back up from central water system**
  - **Sanitary waste- Composting toilets**

Schematic Design of Water/ wastewater System



1. Gutters drain rainwater to cistern.
2. Float valve in cistern controls city water to maintain cistern at minimum of 1/3 full (if no rain). Top 2/3 of tank is for rainwater.
3. Attic tank filled by submersible pump in cistern and controlled by float valve in attic tank.
4. Sink drain water to drainfield under house garden.

Composting Toilet



- **Waste drops into composter below.**
- **Composted waste is removed from bottom drawer (once a year) — ready for use on garden.**
- **No odor—gases exhausted to roof.**

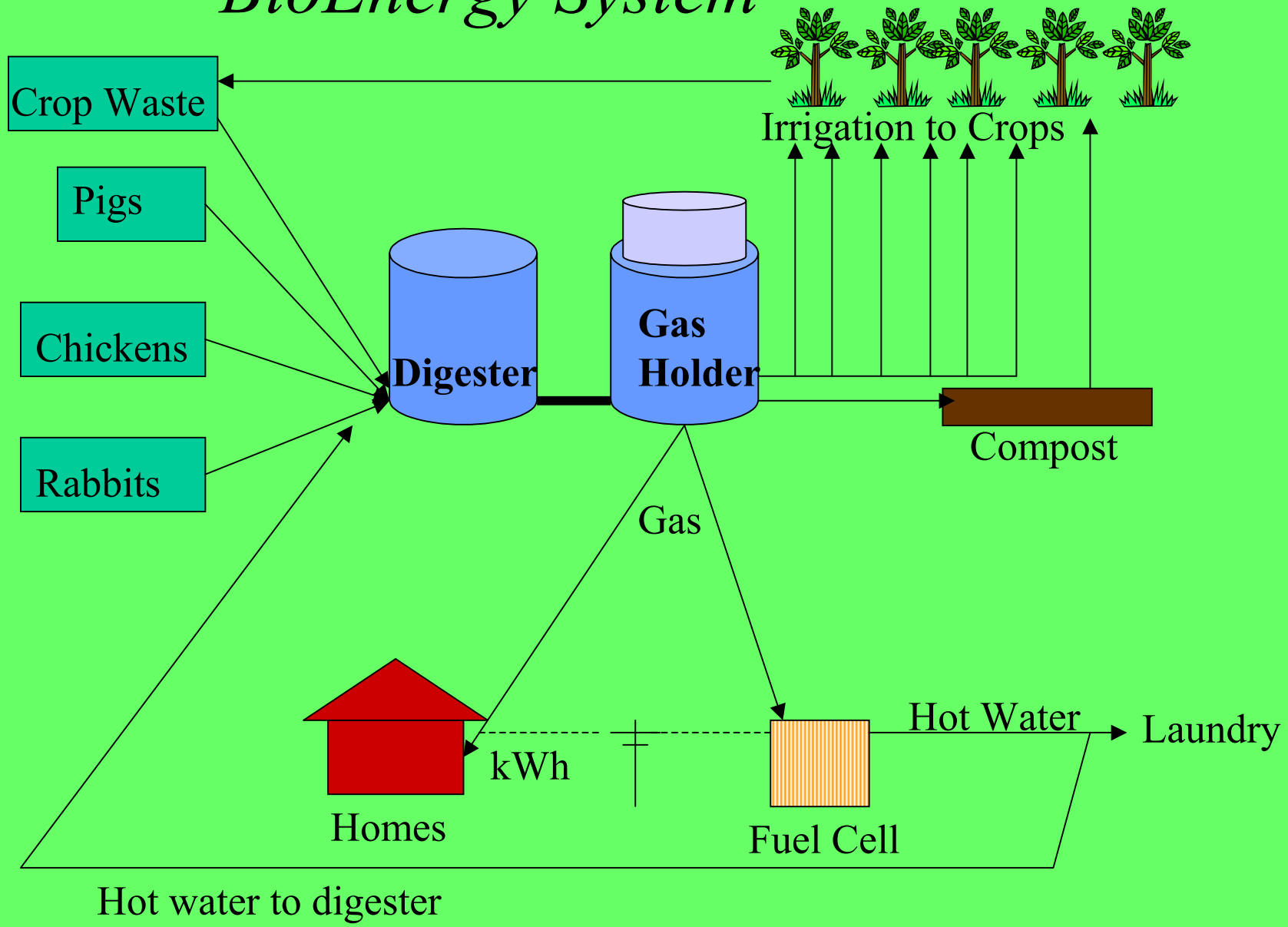
Longju Model Sustainable Village Design Features

- **Central Biogas Plant**
  - **Collects animal waste from pigs, chickens and ducks**
  - **Produces Biogas for home cooking and electricity generation and organic fertilizer. Waste water is used for irrigation**
  - **Central 250 kW Fuel Cell powered by biogas. The fuel cell will provide 100% of the village power requirements. The village will also be connected to the Central Power Grid.**
  - **Solar PV option on homes**

Sustainable Principles

- **The Village's Natural System**
- **Eliminate Waste**
- **Maximize the use of the villages natural resources**

BioEnergy System

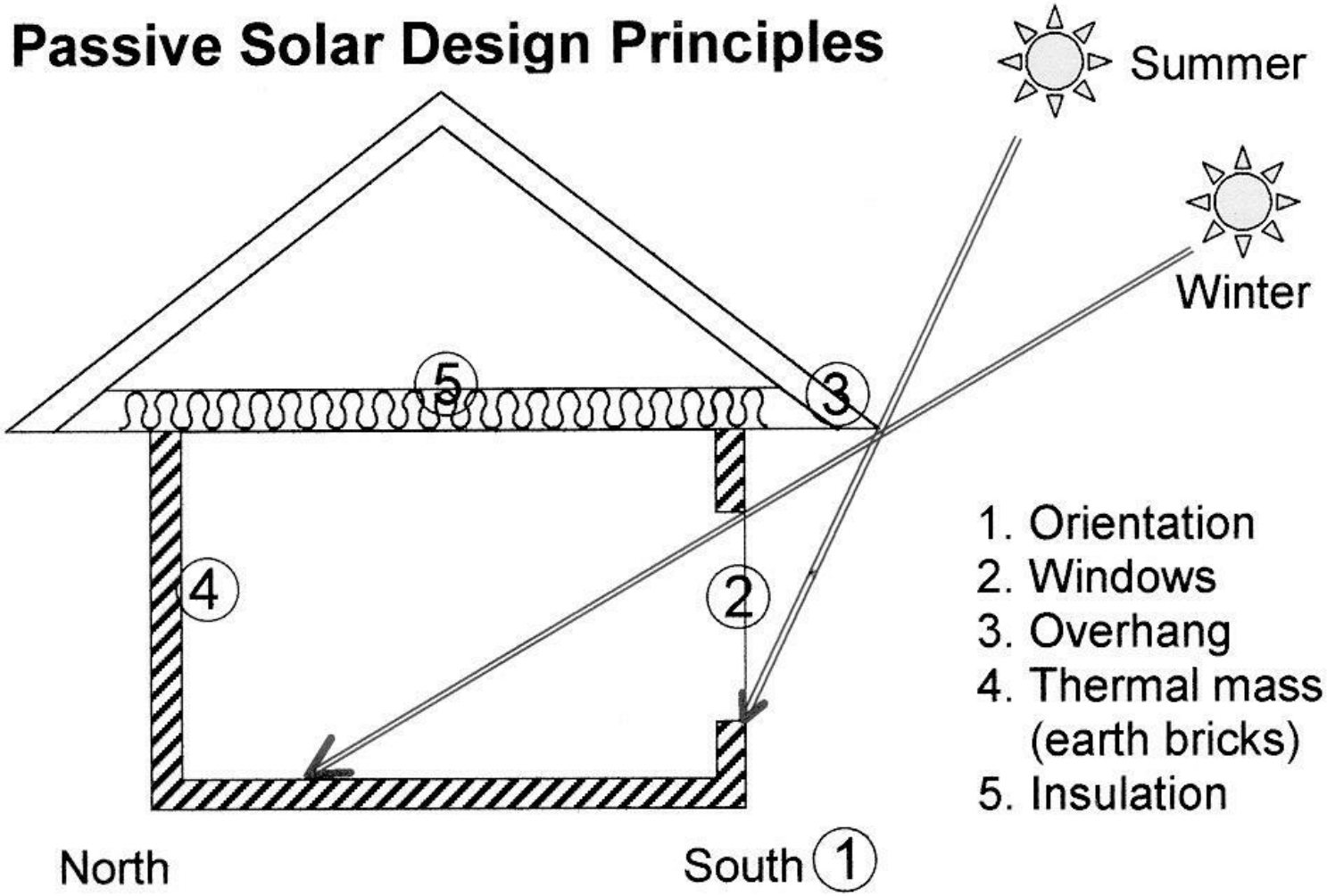


International Center for Sustainable Development Inc.
August, 2001

Longju Model Sustainable Village Design Features

- Building Design
  - **Buildings oriented to south and let sun in the windows in winter and shade in summer for good comfort and health**
  - **Solar water heater and solar PV ready**
- Building Construction
  - **Construction using earth blocks made on site**

Passive Solar Design Principles



1. Orientation
2. Windows
3. Overhang
4. Thermal mass (earth bricks)
5. Insulation

1. Orient most window glass to South, less toward East and West, little toward the North.
2. Use energy-efficient windows.
3. Design overhang to shade summer sun but let winter sun in.
4. Build walls of high mass materials to store thermal energy.
5. Use good ceiling insulation.

Longju Model Sustainable Village Design Features

- **Earth Block Advantages**
  - **Low cost- Materials are free from the site**
  - **Good comfort**
  - **No pollution from the manufacturing of the earth block. Standard block and brick manufacturing burns large amounts of coal and oil for transportation**
  - **Micro Enterprise opportunity**

Longju Model Sustainable Village Design Features

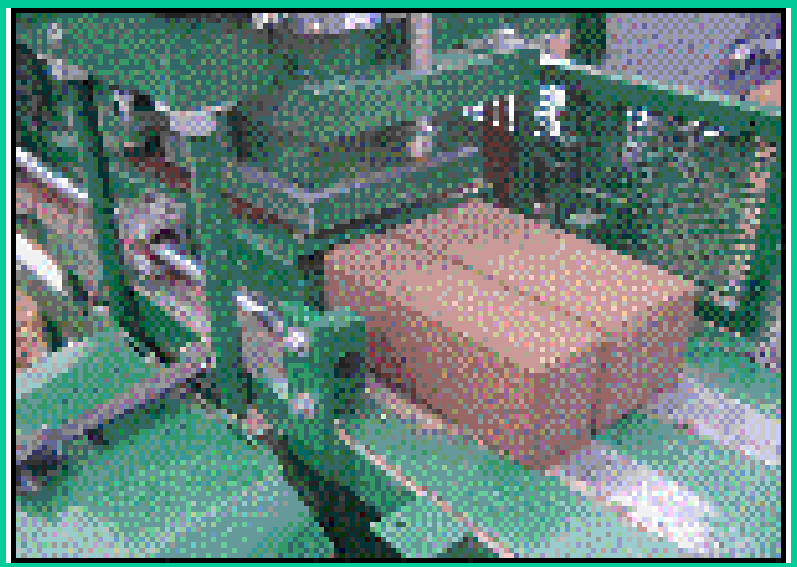
Earth Blocks

Sustainable Principles

- **Maximize the use of the villages natural resources**
- **Protect all natural living systems**
- **Eliminate Waste**
- **Improve the efficiency**
- **Establish community organizations for the benefit of all villagers**

Compressed Earth Bricks

The “Green Machine”



Features of the sustainable village:
Passive Solar Design

Passive solar design techniques should be used to efficiently provide indoor comfort throughout the year with little or no energy

- **Orient windows to the south for passive solar heat**
- **Fixed overhangs to shade windows in summer**
- **Good cross ventilation**
- **Thermal mass to hold heat and cool**
- **Flexible architecture**