



DECENTRALIZED APPROACHES TO RURAL WASTEWATER TREATMENT IN CHINA: SITUATION AND CHALLENGE

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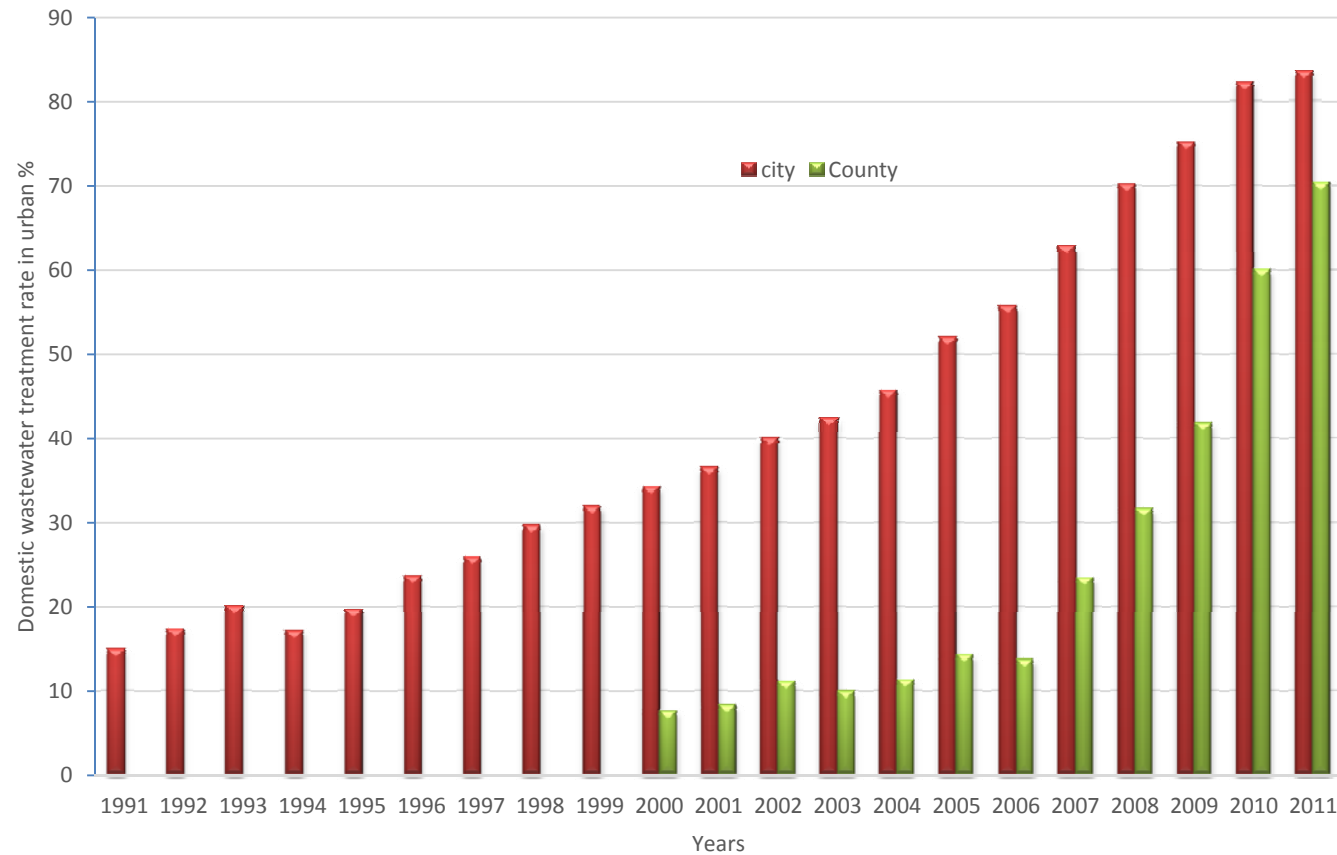
North Center for Rural Wastewater Treatment Technology Research
Ministry of Housing and Urban-Rural Development, China

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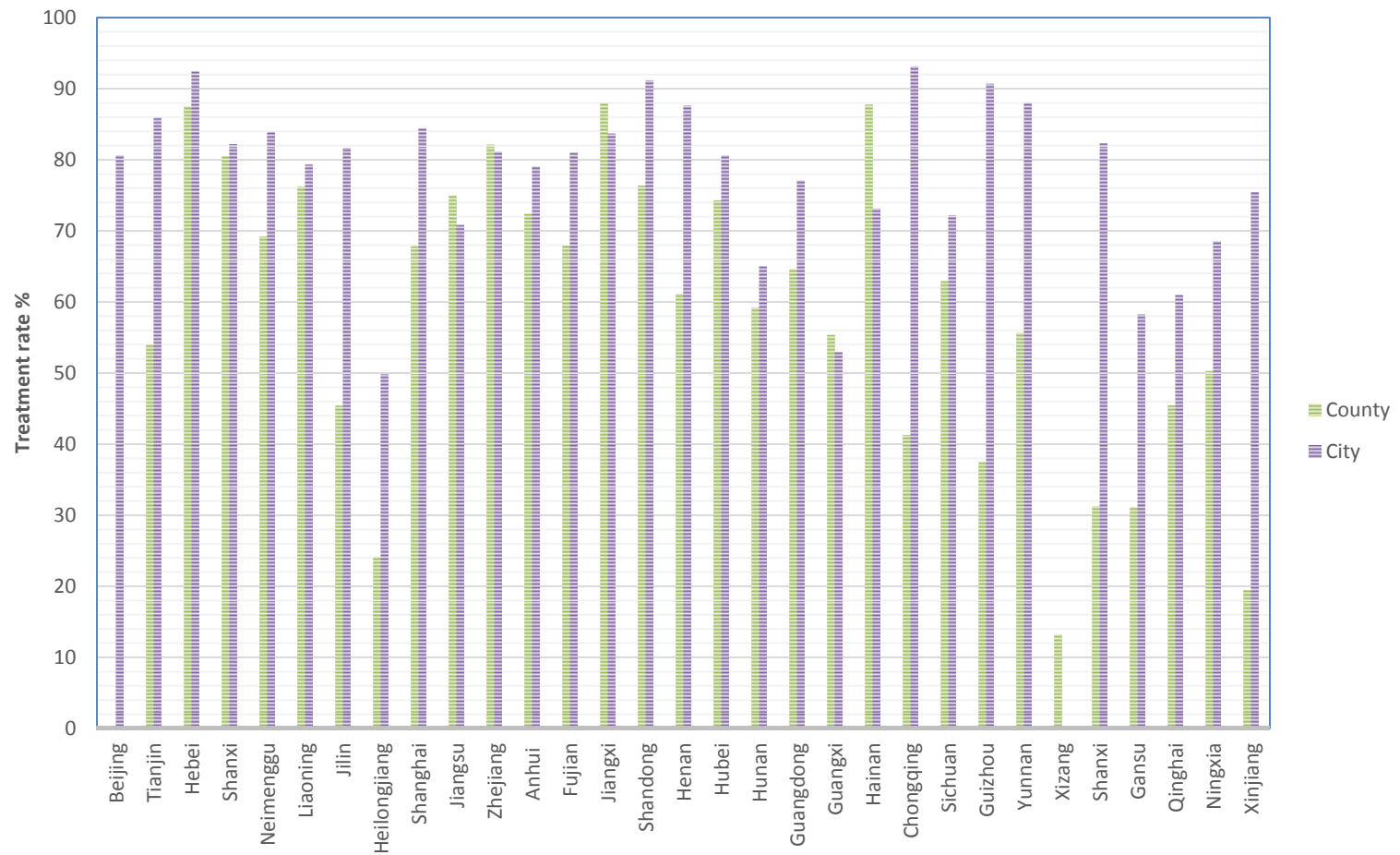
Domestic wastewater treatment coverage in population by on-site and off-site systems



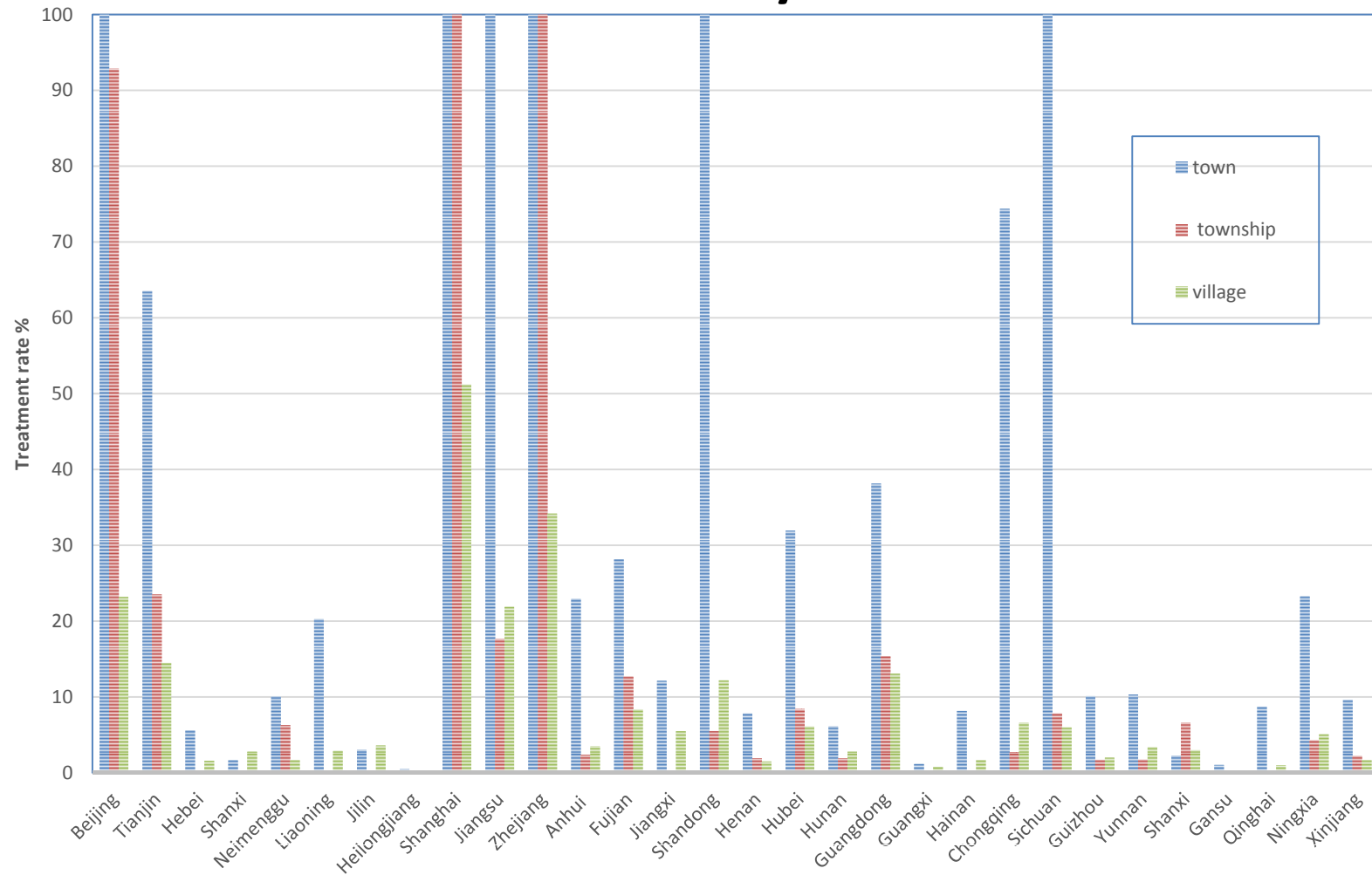
Domestic wastewater treatment rate in urban from 1991 to 2011



Domestic wastewater treatment rate in urban in 2011 year

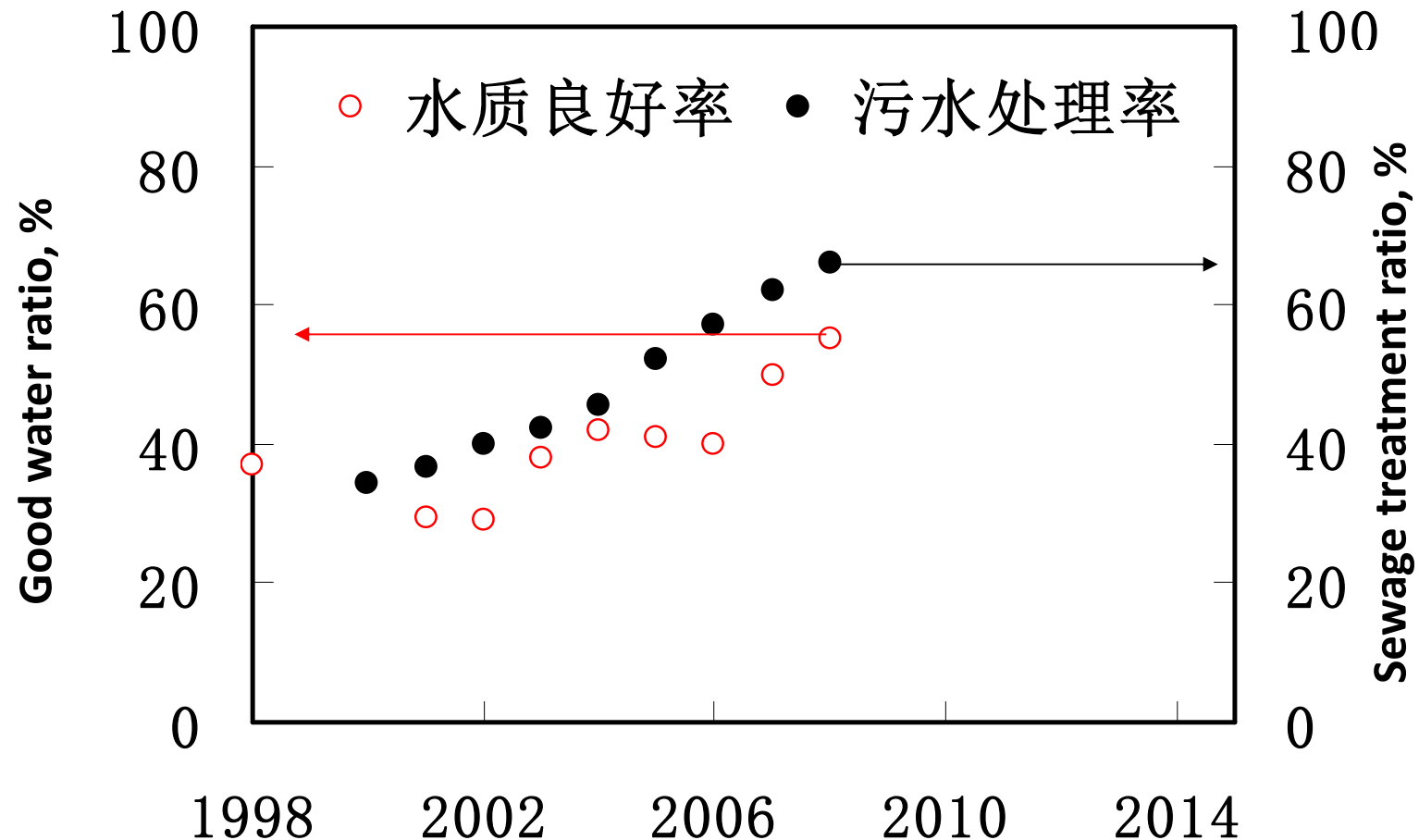


Domestic wastewater treatment rate in 2011year



Water Pollution Situations

Good water ratio: percentage of sections meet Class I-III standards



Construction of MWTPs contributes to the improvement of water quality. But it is not enough.

Pollution loads

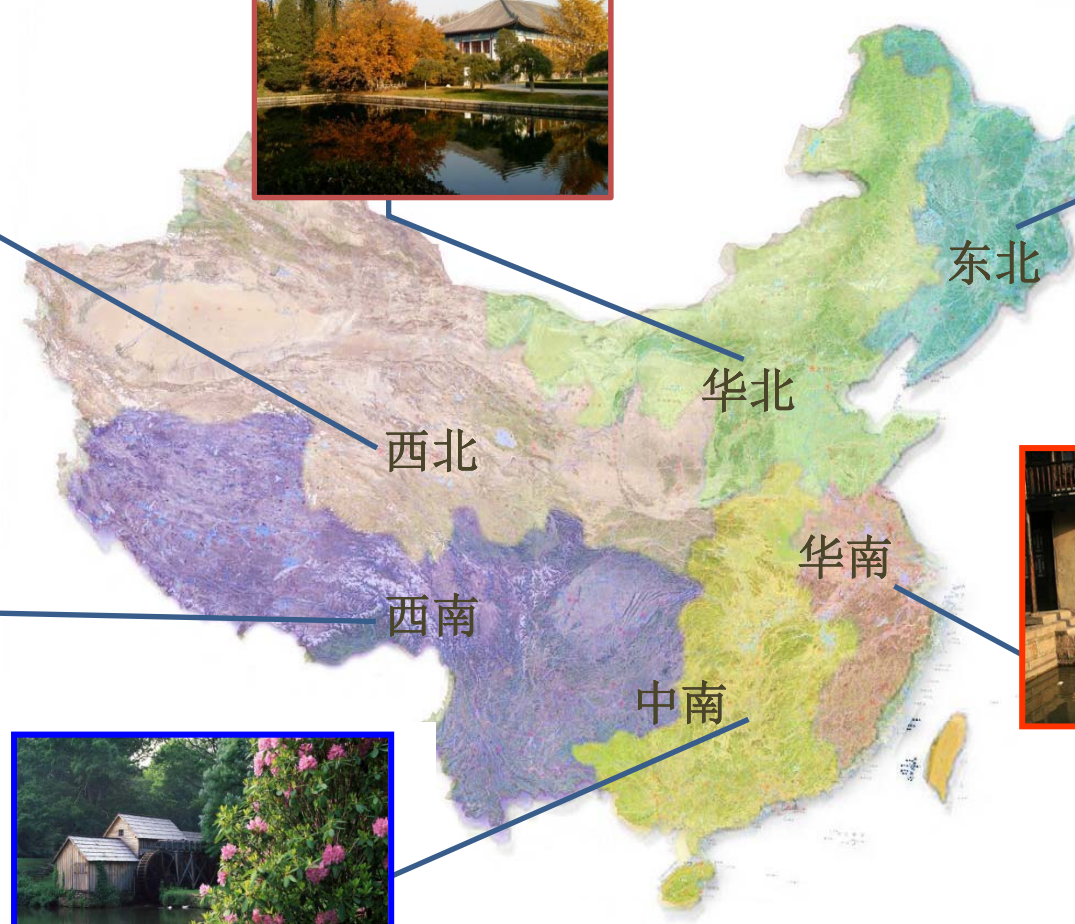
| | town | village | T&V | city |
|---|-------------|-------------|-------------|-------------|
| SV($10^8\text{m}^3/\text{a}$) | 3.6 | 5.6 | 9.2 | 33.0 |
| COD(10^6t/a) | 2.6 | 5.4 | 8.0 | 8.6 |
| N(10^6t/a) | 0.5 | 1.1 | 1.6 | 0.97 |
| P(10^6t/a) | 0.04 | 0.07 | 0.11 | |

SV: sewage volume

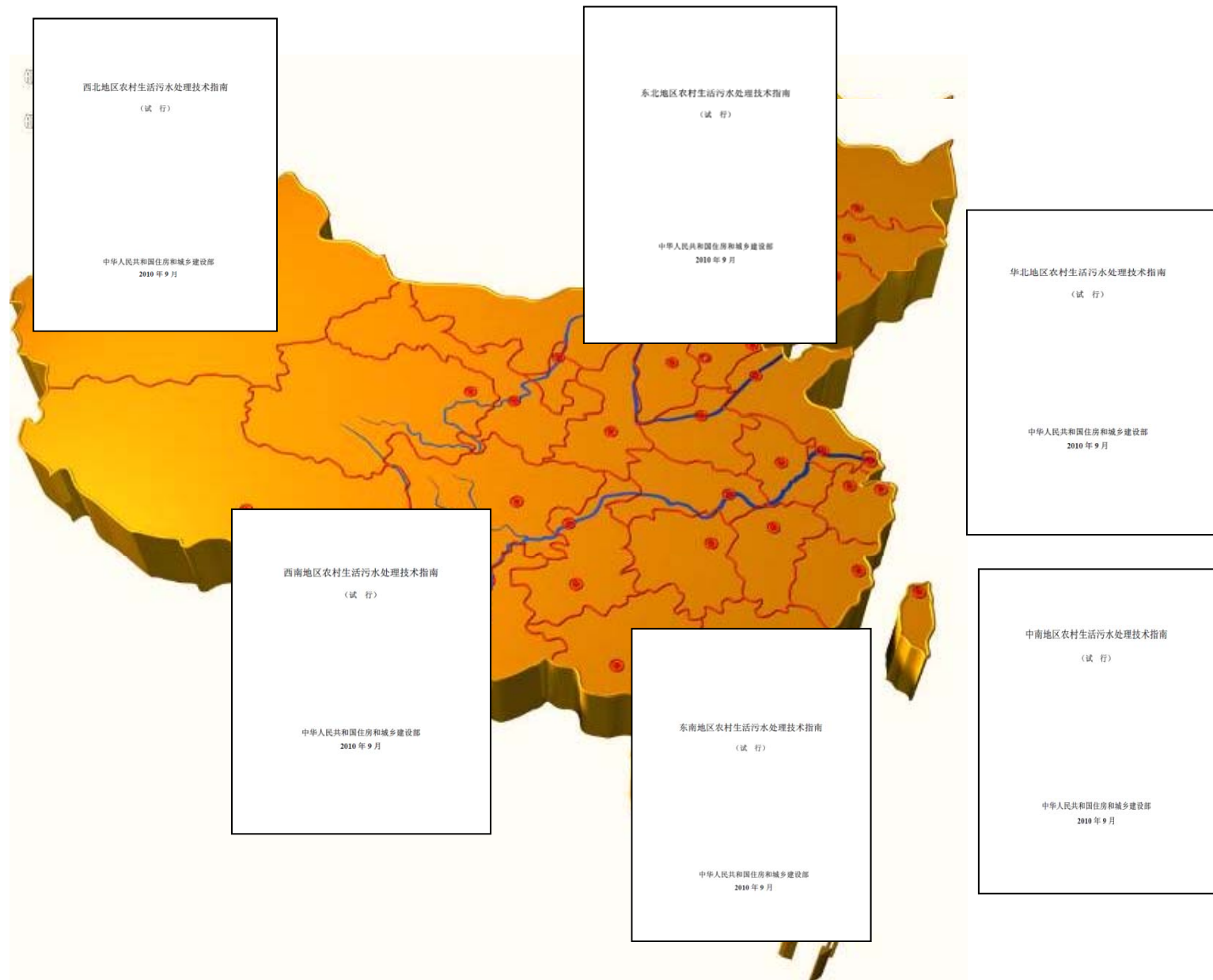
**Support systems at national/local level by
government for promotion of on-site domestic
wastewater treatment**



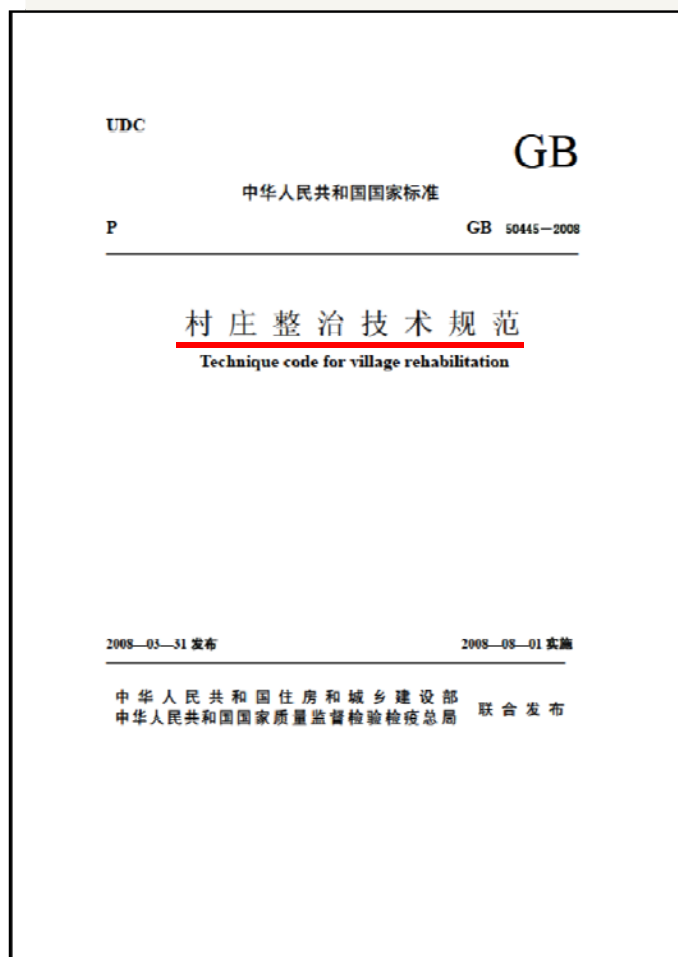
Guides



不同区域农村生活污水处理技术指南



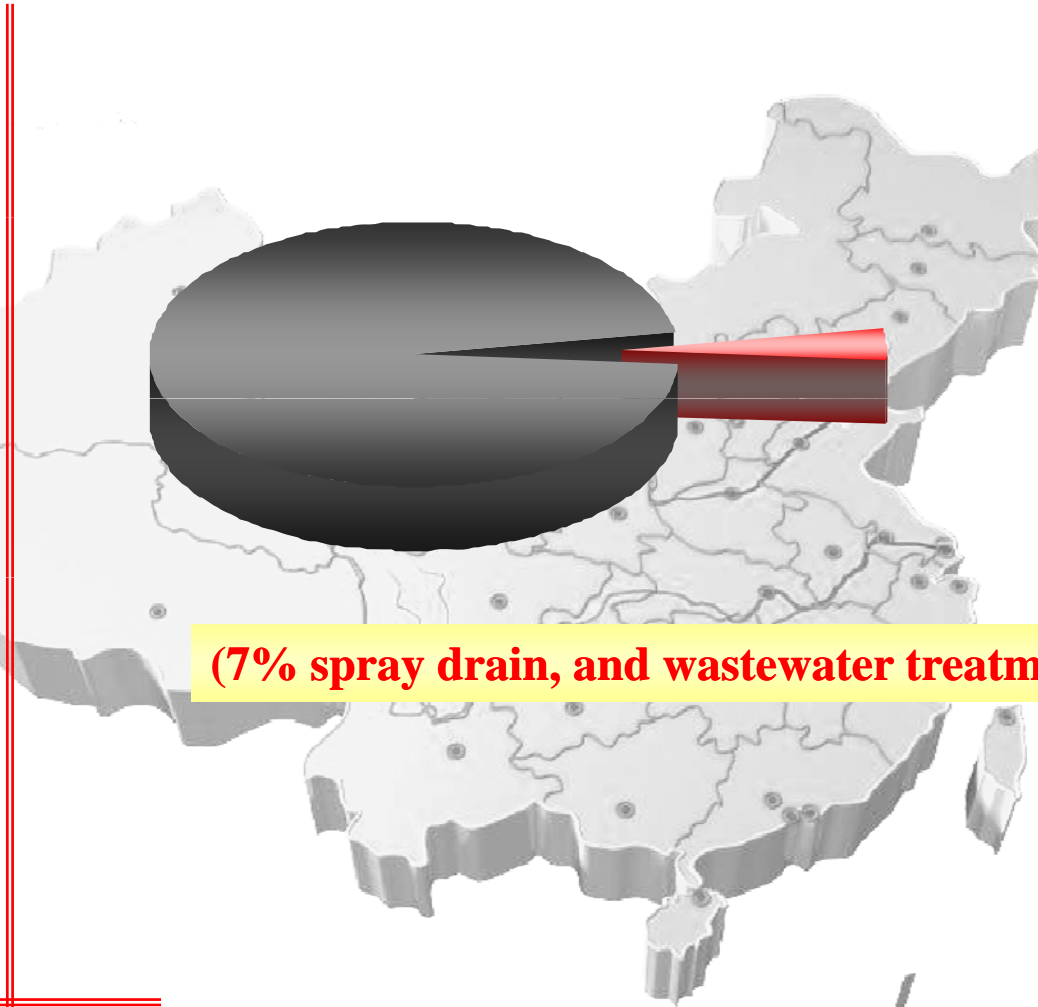
Technical code and specification



Introduction of several popular on-site treatment technologies in China



Rural wastewater

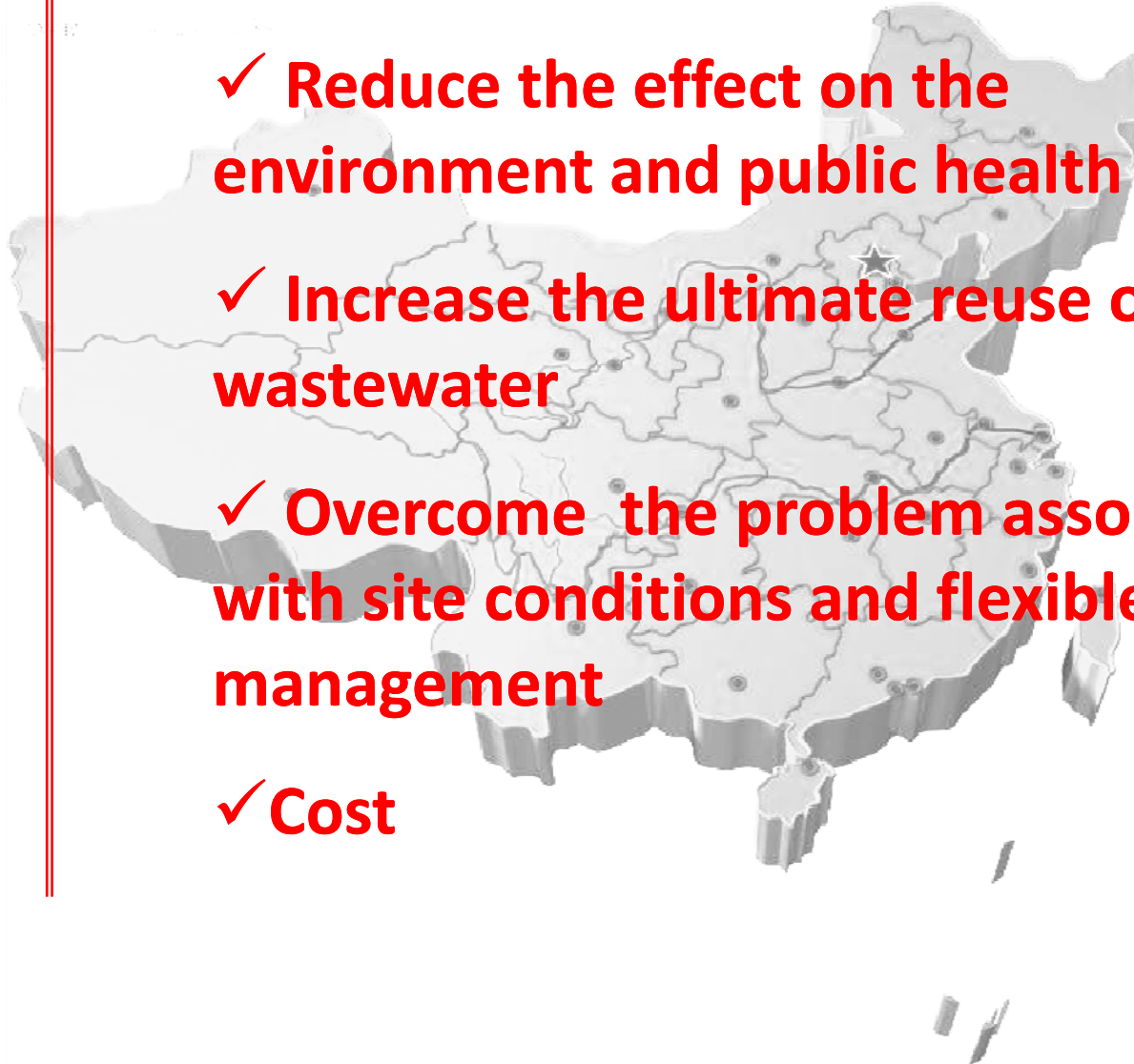


(7% spray drain, and wastewater treatment)

Decentralized technologies



- ✓ Reduce the effect on the environment and public health
- ✓ Increase the ultimate reuse of wastewater
- ✓ Overcome the problem associate with site conditions and flexible in management
- ✓ Cost



Needs for decentralized wastewater systems

1. Satisfy the demand of **public health** and various **water quality** goals;
2. **Economic suitability** of processing technologies;
3. **Operation simple** and **easy routine management**.

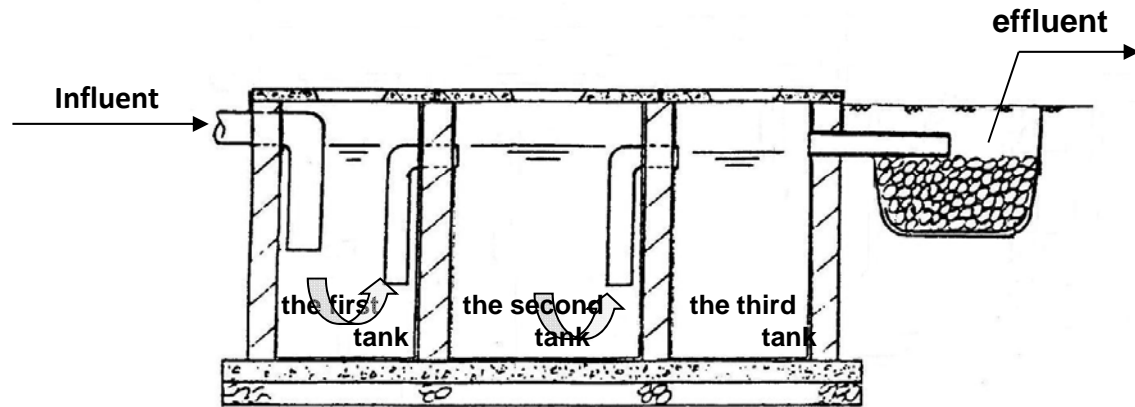


Types of decentralized wastewater systems

- **Primary treatment**
 - Septic tank
- **Secondary treatment----Biological technologies**
 - Biofilm
 - Anaerobic digesters
- **Eco-technologies**
 - Constructed wetlands
 - Leach trenches
- **Community Systems**

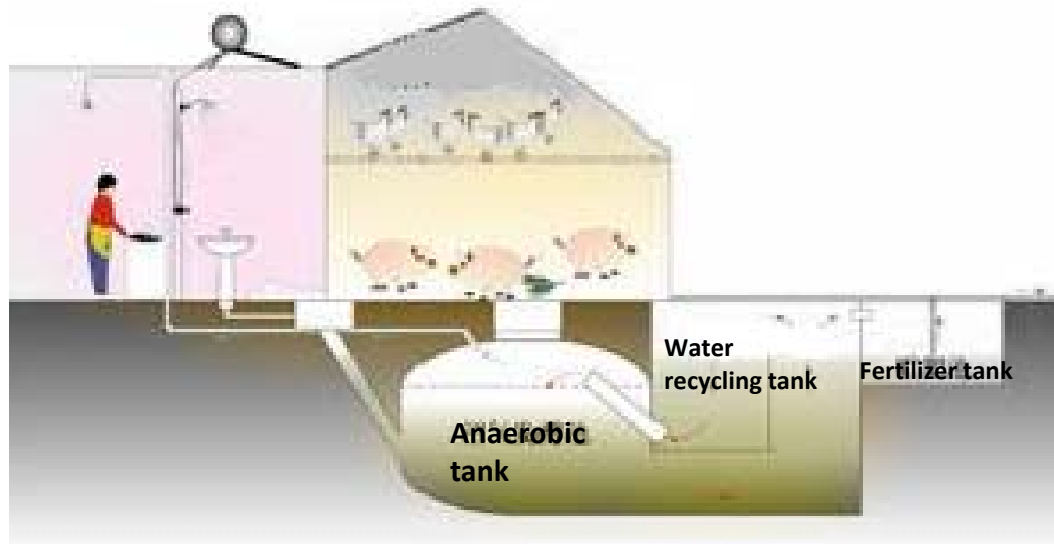
Case study: Septic tank

- Inexpensive
- Simple to maintain

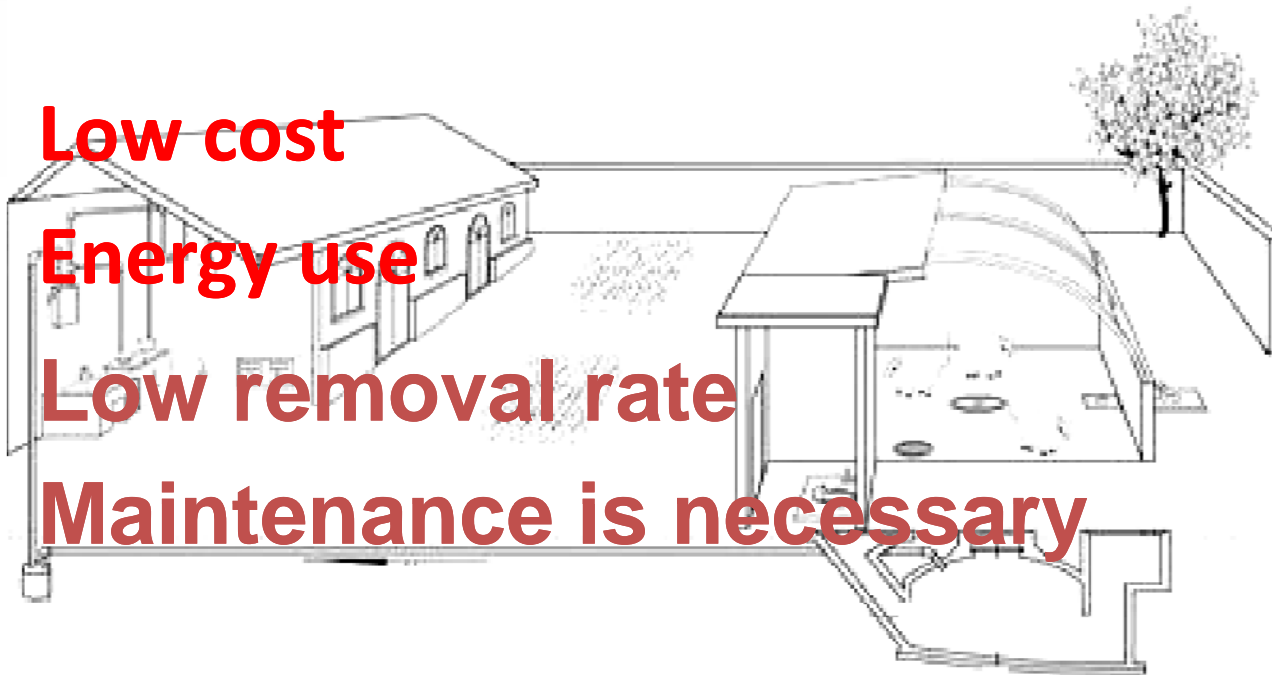


- Sludge may cause an odor problem
- Not effective in removing nitrate and phosphorus and pathogenic organics
- Potential pollution source of groundwater

Case study: Anaerobic Treatment



- Low cost
- Energy use
- Low removal rate
- Maintenance is necessary



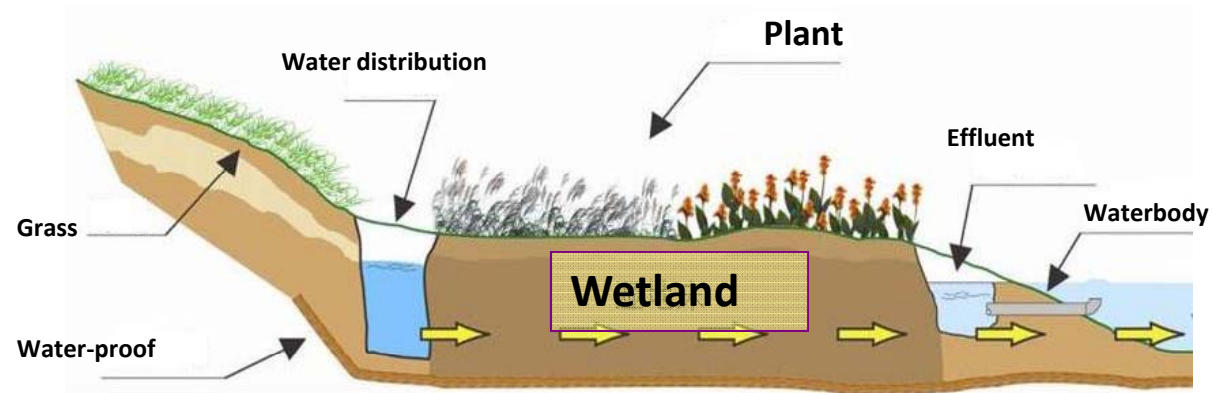
Case study: Activated sludge



1m³,2m³,5m³,10m³,15m³/day

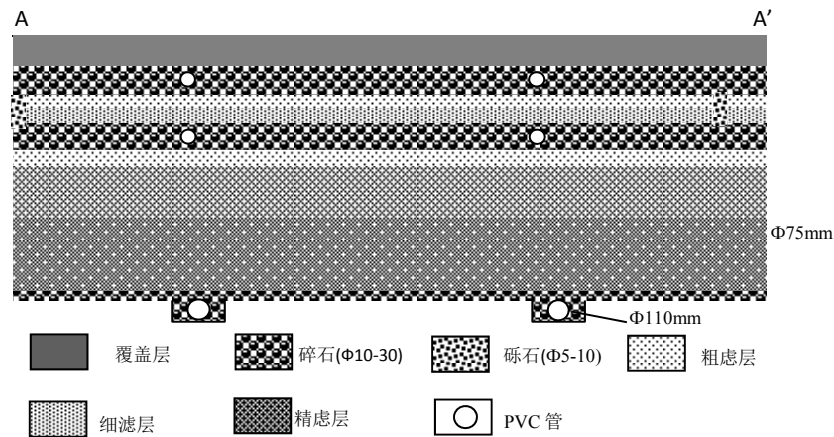
- **Flexible for decentralize wastewater treatment**
- **Automatic control**
- **Expensive for single family**
- **management is relative complex**

Case study: Constructed wetland



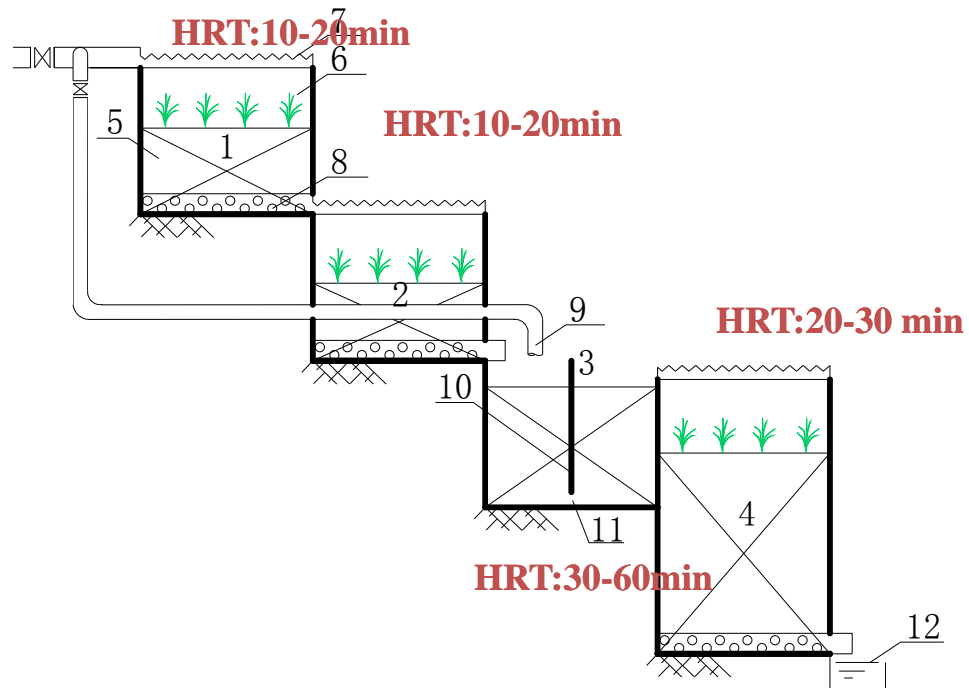
- constructed cost
- flexible land use
- Low removal rate
- Management

Case study: Leach Trenches



- Constructed and operation simple
- Low cost
- pollution of groundwater
- Poor quality of effluent

Case study: anaerobic tank+ ladder eco-filter

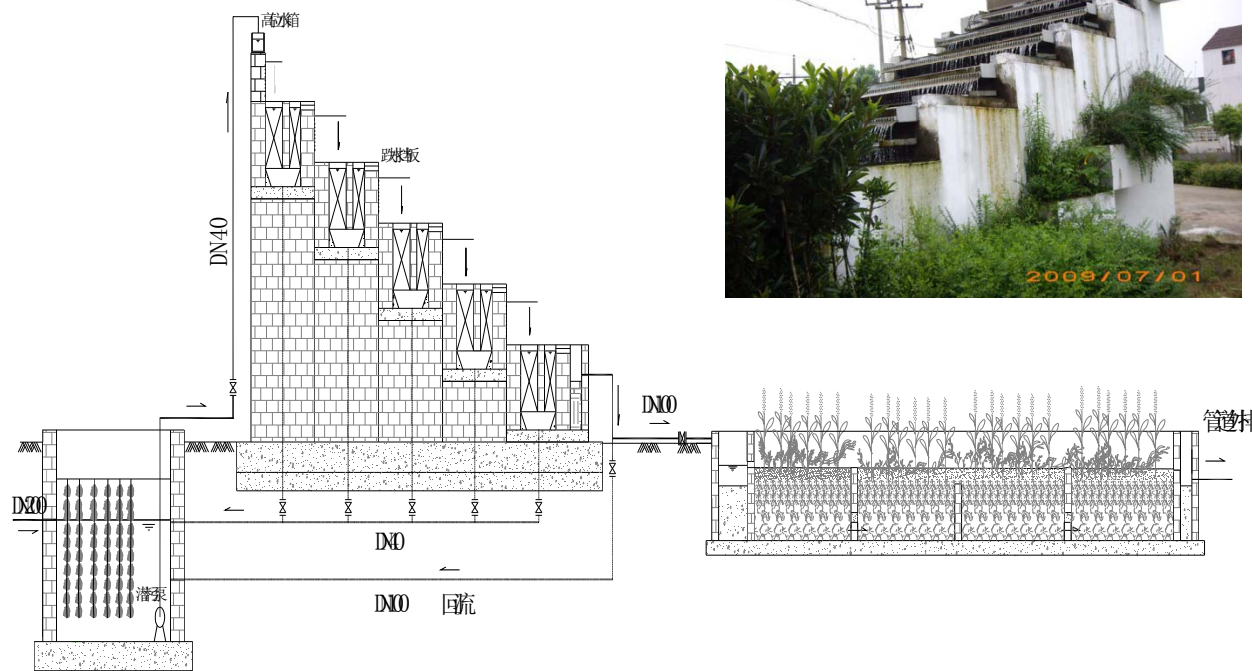


- Energy save
- Amonium and phosprous removal
- Odor

Unit: mg/L

| item | COD | BOD ₅ | NH ₄ ⁺ -N | TN | TP | SS |
|----------|-----|------------------|---------------------------------|----|----|-----|
| Influent | 400 | 150 | 25 | 40 | 4 | 200 |
| Effluent | 60 | 20 | 8 | 20 | 1 | 20 |

Case study: Anaerobic+ drop aeration + constructed wetland



Anaerobic tank

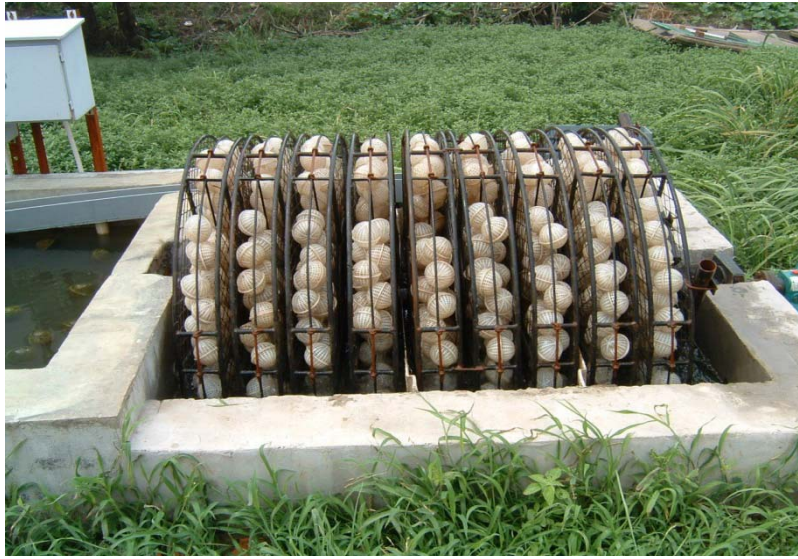
Oxic

Constructed wetland



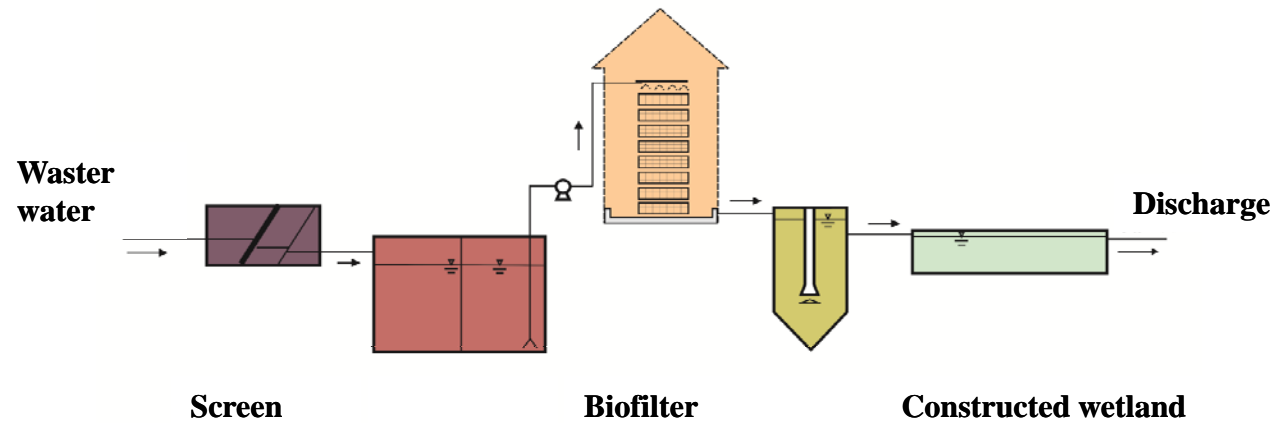
Case study: Bio- rotation + vegetable tank

3~10t/d, COD concentration is 100~100mg/L



- Suitable in south area
- Vegetable management complex

Case study: Cluster system



- Cluster system
- High quality of effluent

- 60m³/d, for 900 persons
- floor area: 250m²



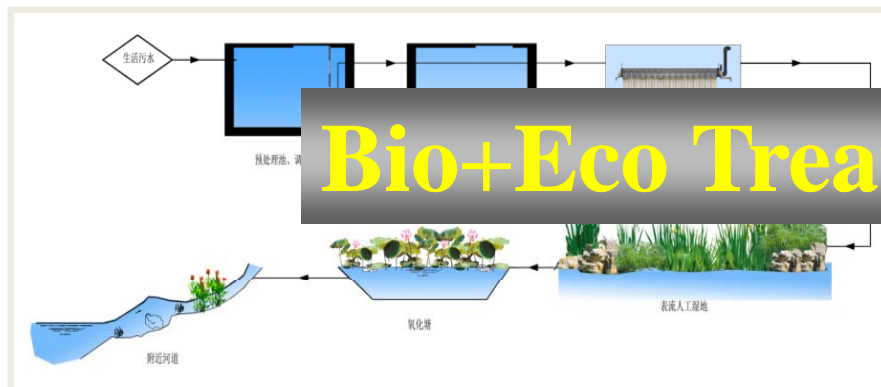
Decentralized wastewater systems

■ For COD removal



Aeration process

■ For nitrogen removal



Bio+Eco Treatment



Challenges in promoting on-site wastewater treatment



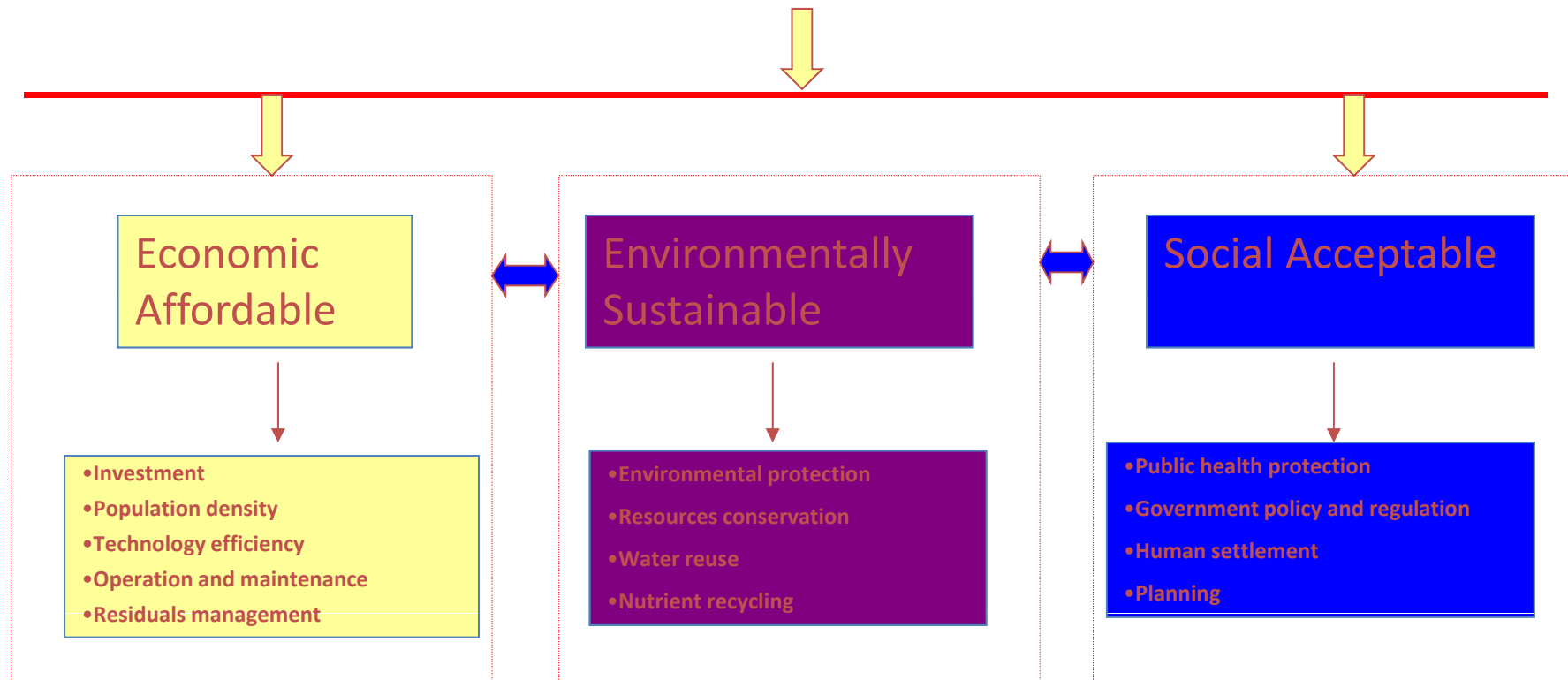
Situation

- **Lack of knowledge of decentralized systems**
- **Lack of long-term operation data**
- **Management needed**
 - systems are a cost-effective and long-term option for meeting public health and water quality goals
 - Who is responsible? Typically homeowner for onsite, Inadequate methods of needs assessment



Developing for decentralized system in China

Appropriate technology



Developing for decentralized system in China



- Policy
- Specifications
- R&D of technologies
- Long-term evaluation
- Operator training

Thanks for your attention!

