



Decentralized Wastewater Treatment for Rural Area in China ——Situation and Challenge

Dr. Hui Zhao
Deputy Director-General

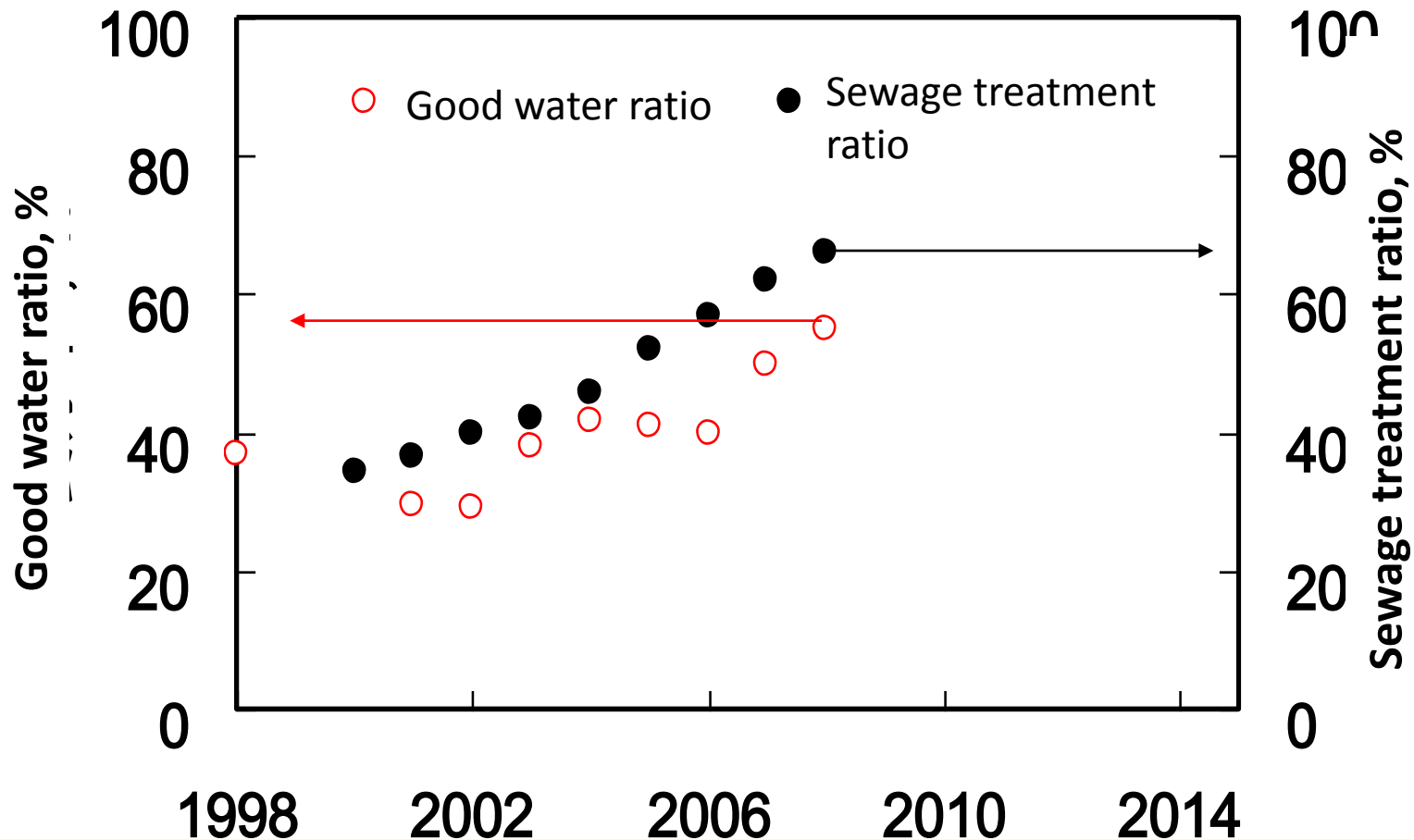
Department of Rural Development
Ministry of Housing and Urban-Rural
Development of the People's Republic of China

Situation of Domestic Sewage

Pollution from Rural Area in China

Water Pollution Situations

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

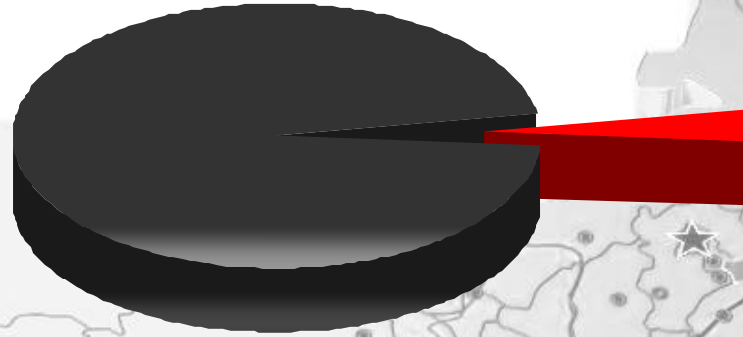


Construction of MWTPs contributes to the improvement of water quality. But it is not enough.

Background of Rural Area

- **Town number: 18 , 000**
- **Village number: 0.6 million**
- **Population in T&V area: 910 million (66%).**
- **Poor infrastructure conditions**
- **Weak economy: low GDP in comparison with cities.**

Rural wastewater



• Only 5% of villages and 18% of towns have wastewater treatment facilities

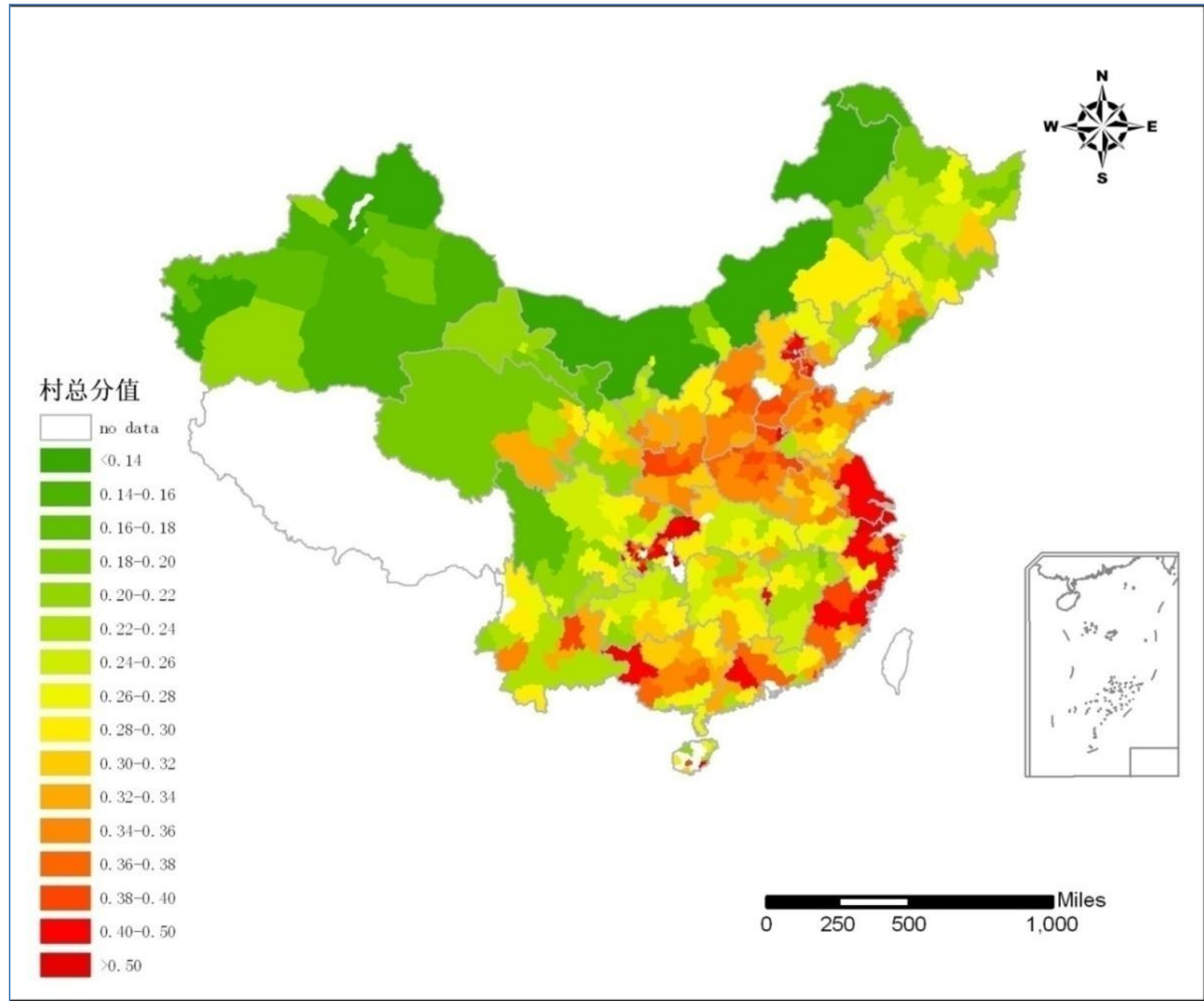
• Most parts of feces are applied as fertilizer

Pollution loads

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

SV: sewage volume

Rural sewage treatment priority



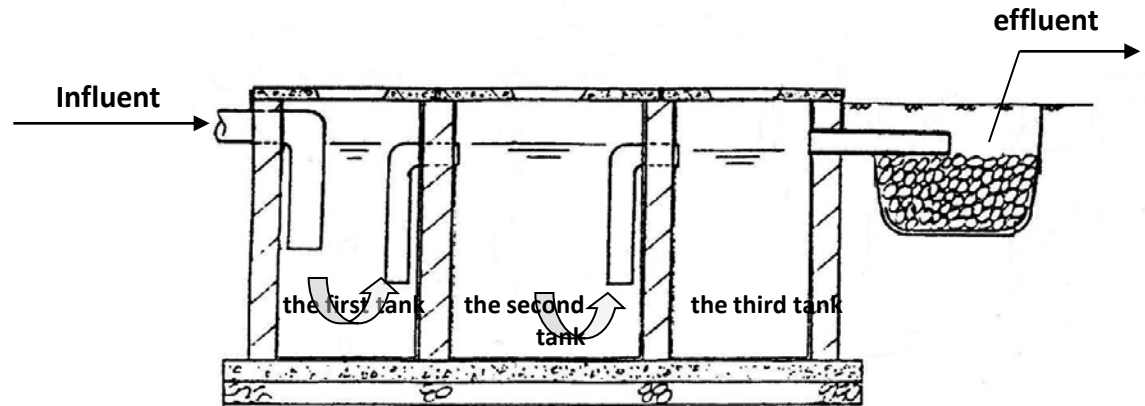
Decentralized Technologies for Rural Wastewater Treatment in China

Types of decentralized wastewater systems

- **Primary treatment**
 - Septic tank
- **Secondary treatment----Biological technologies**
 - Biofilm (生物膜)
 - Anaerobic digesters(厌氧处理)
 - Activated sludge(活性污泥)
- **Eco-technologies**
 - Constructed wetlands (人工湿地)
 - Leach trenches(土地渗滤)
- **Community Systems**

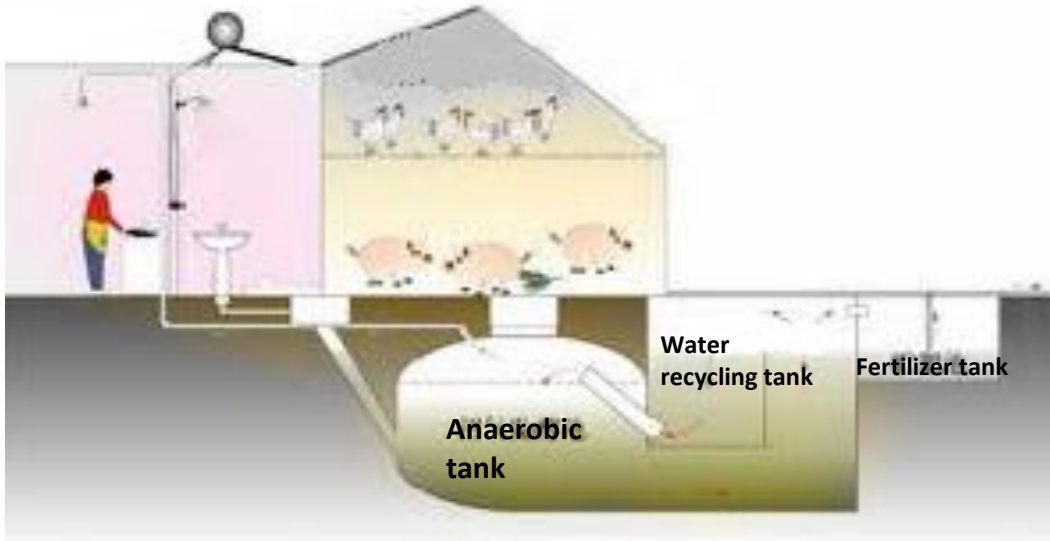
Case study: Septic tank

- Inexpensive
- Simple to maintain

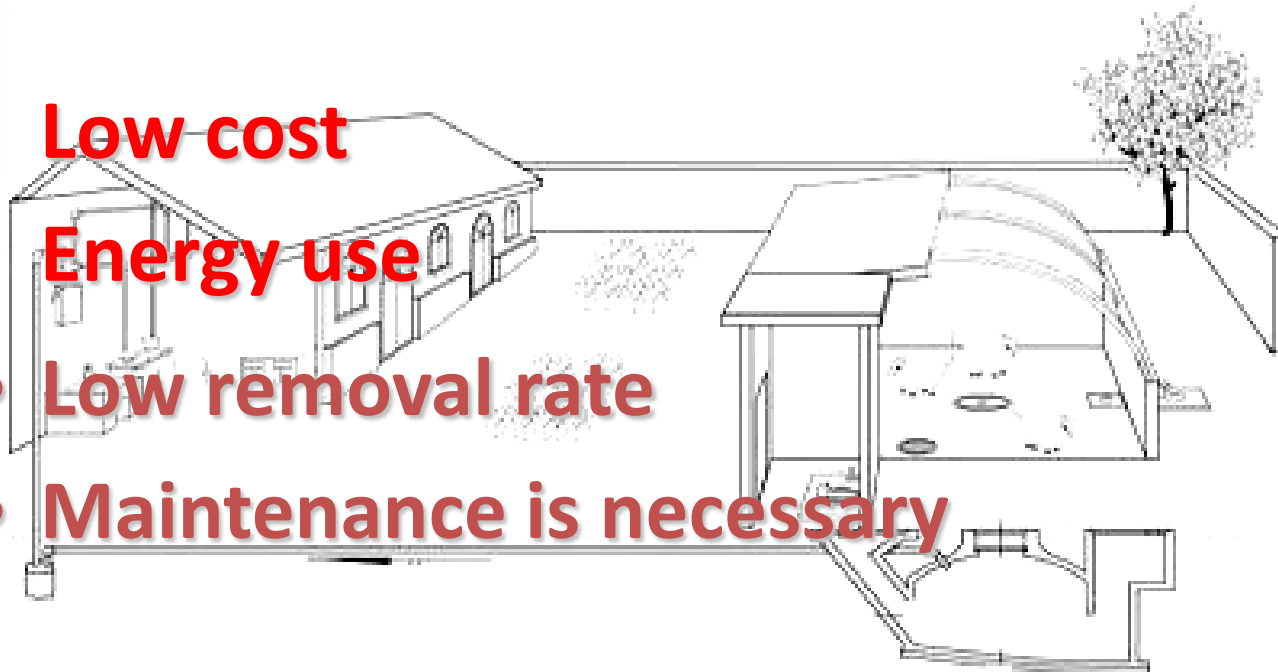


- Sludge may cause an odor problem
- Not effective in removing nitrate and phosphorus and pathogenic organics
- Potential pollution source of groundwater

Case study: Anaerobic Treatment



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



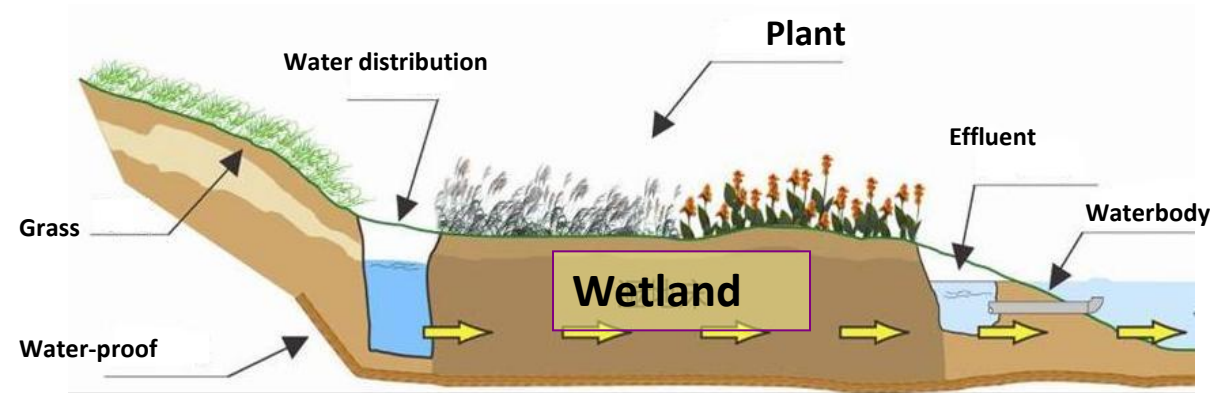
Case study: Activated sludge



1m³,2m³,5m³,10m³,15m³/day

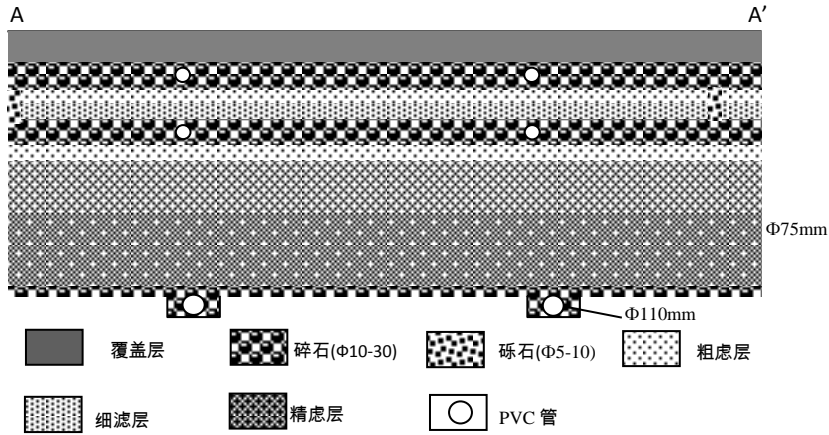
- **Flexible for decentralize wastewater treatment**
- **Automatic control**
 - Expensive for single family
 - management is relative complex

Case study: Constructed wetland



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

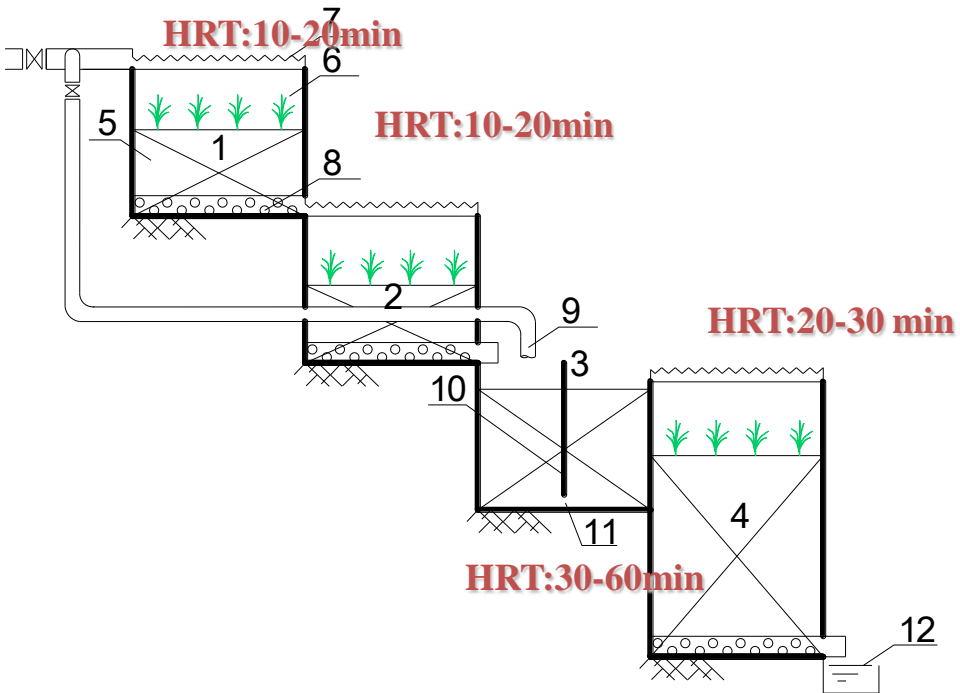
Case study: Leach Trenches



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



Case study: anaerobic tank+ ladder eco-filter



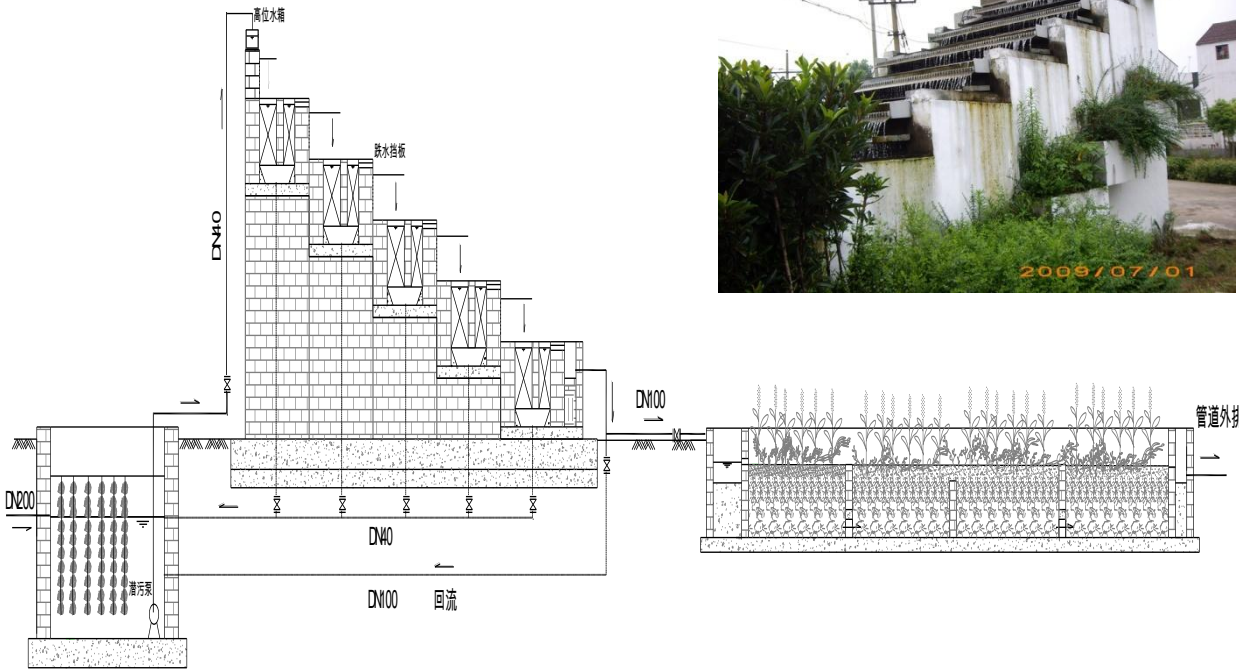
15 m³·d⁻¹

- Energy save
- Ammonium and phosphorus 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

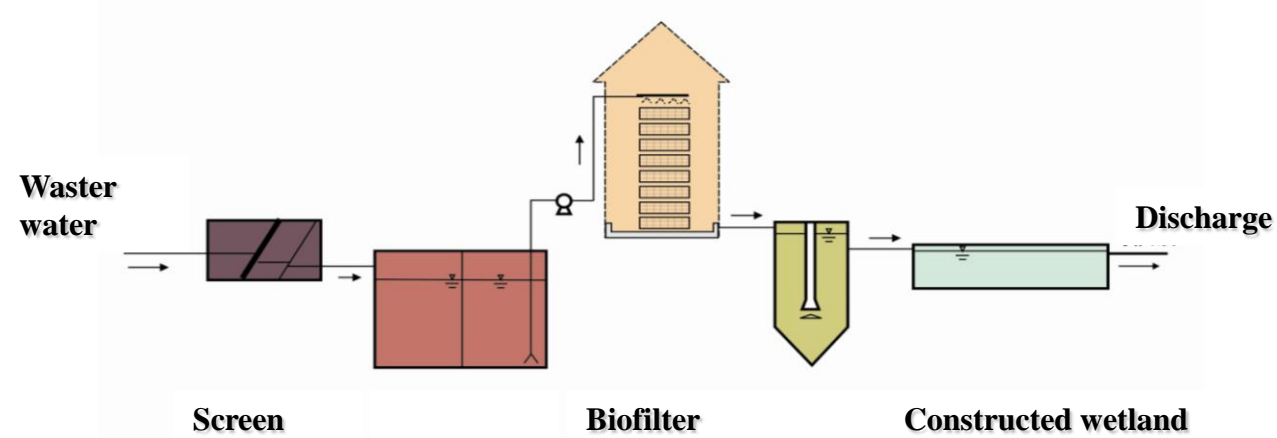
Case study: Bio-rotation + vegetable tank

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



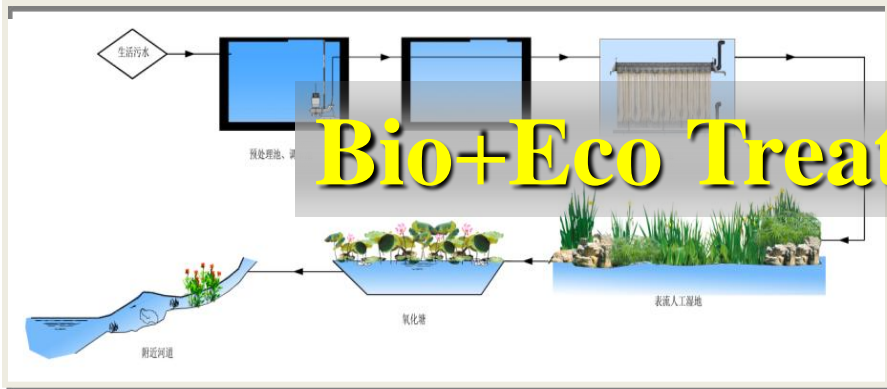
Decentralized wastewater systems

For COD removal



Aeration process

For nitrogen removal



Bio+Eco Treatment



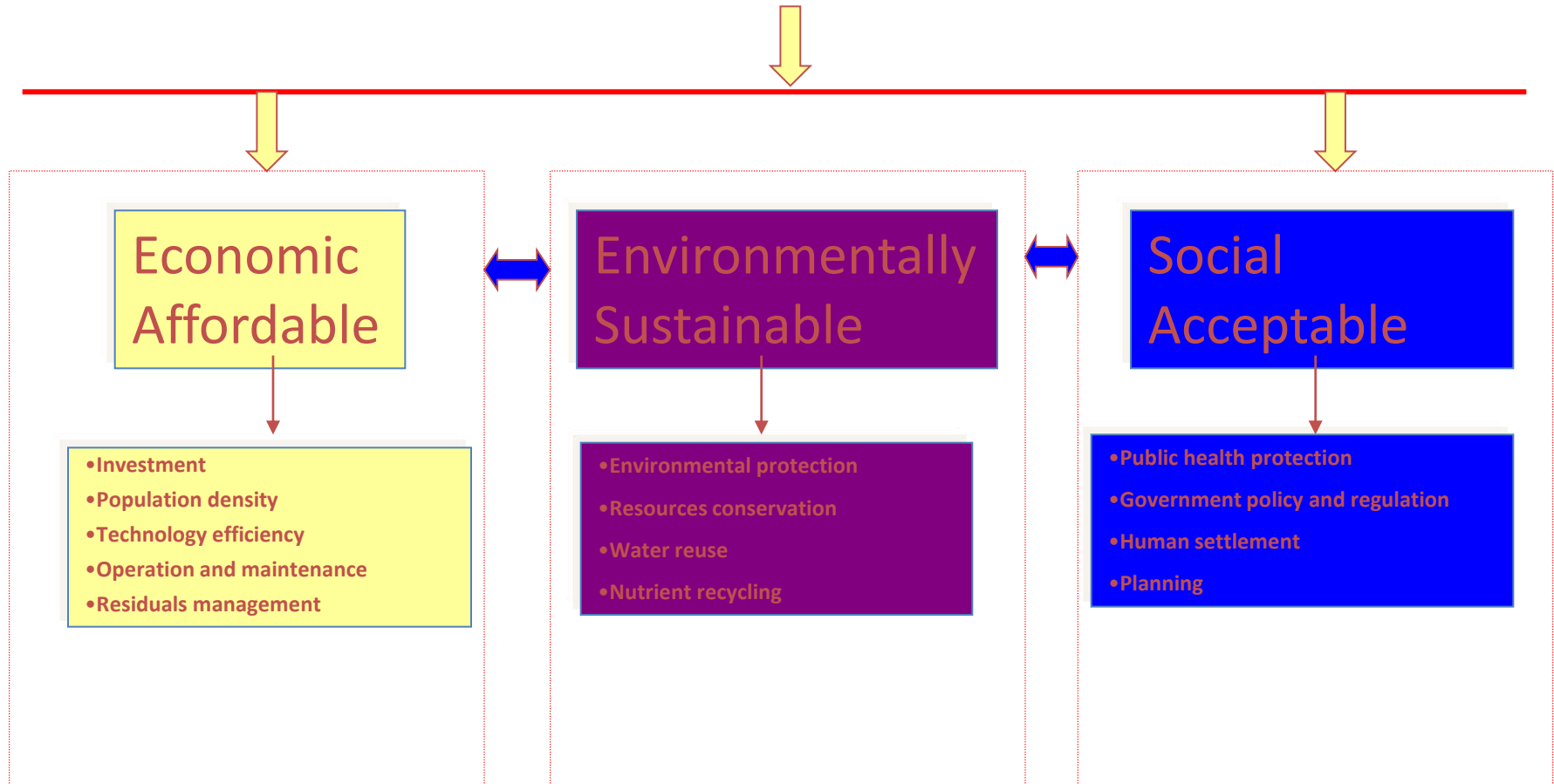
Situation of the technologies

- **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



Actions for Developing of Decentralized System in China

Actions for developing of decentralized system in China



- 
- **To make policies**
 - **To make plans**
 - **To add government budget**
 - **R&D and specifications**
 - **Education and training**

Strategic Plan of Wastewater Treatment in Rural Area

全国村镇污水治理

住房和城乡建设部
二零一零年二月

滇池流域

住房和城乡建设部
二零一零年二月

巢湖流域村镇污

住房和城乡建设部
二零一零年二月

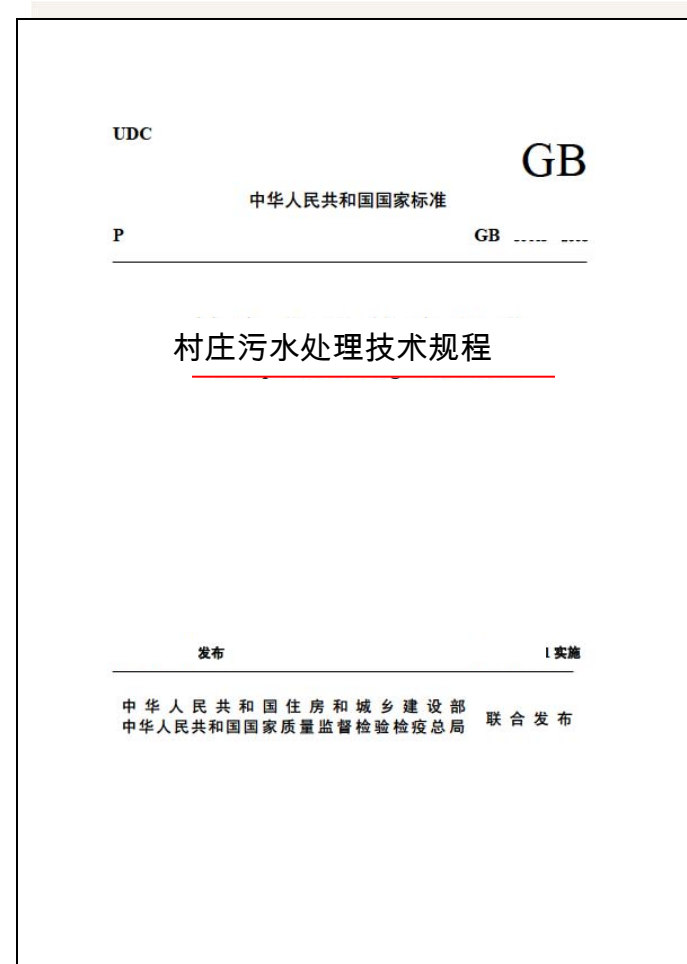
太湖流域村镇污水治理规划

住房和城乡建设部
二零一零年二月

Technical code and specification

Technical specification of wastewater treatment in villages

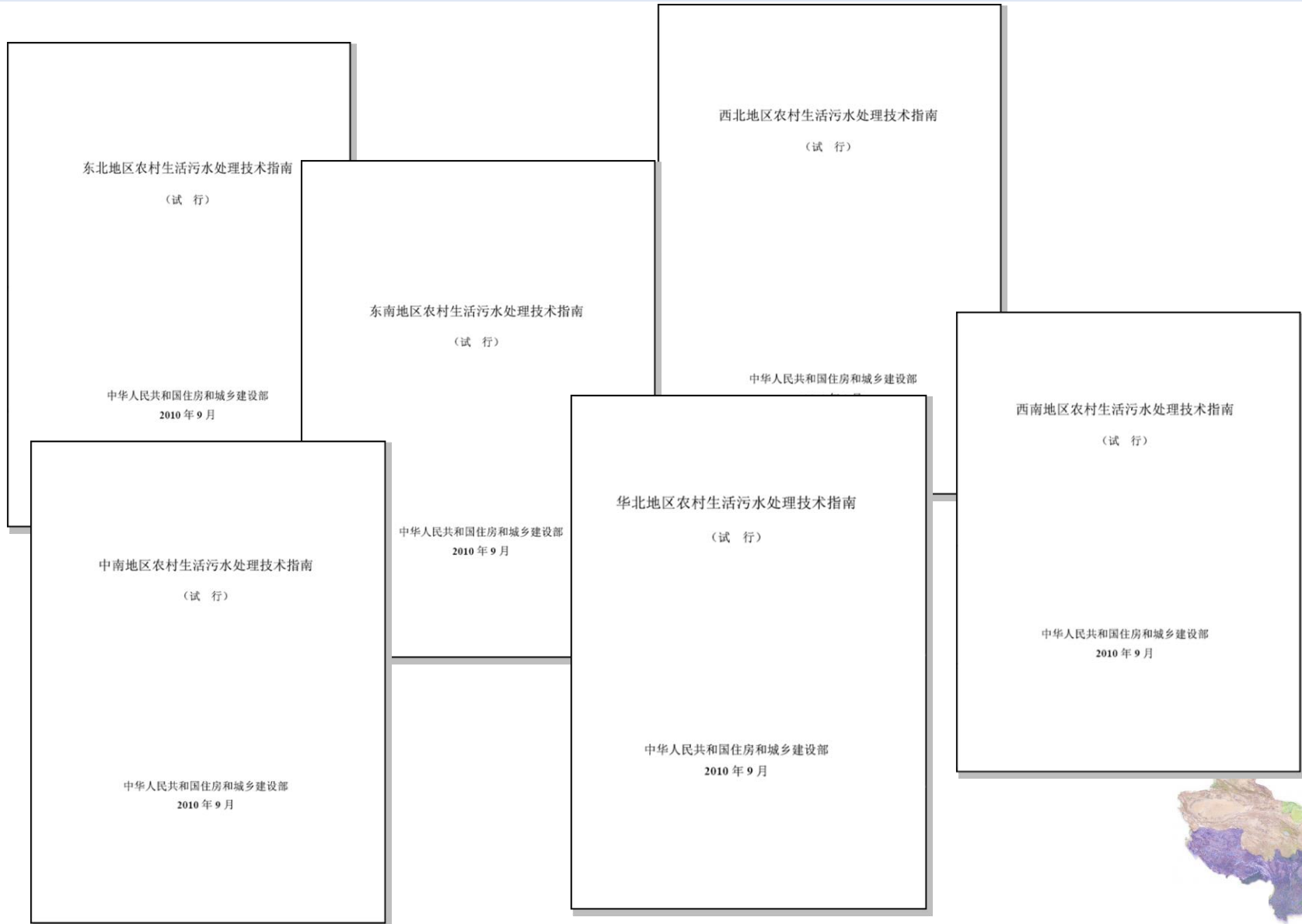
- Decentralized technologies
- Including:
 - Biological treatment
 - Ecological Treatment
 - Combined system
 - Cluster System



Technical Guides for village wastewater treatment in six main regions of China



Technical Guides for village wastewater treatment in six main regions of China



Technical guides for village wastewater treatment in six main regions of China



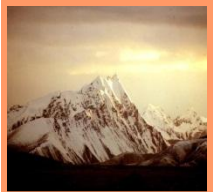
Northeast: septic tanks, anaerobic biofilter, bio-contact oxidation tank, land treatment, constructed wetlands, lagoon.



North China: septic tanks, sewage digesters, normal aeration tank, SBR, oxidation ditch, biological contact oxidation, constructed wetlands, land treatment.



Northwest : septic tank, anaerobic digesters, anaerobic biofilter, constructed wetlands, land treatment.



Southwest : septic tank, wetland, land treatment, anaerobic technology, bio-contact oxidation tank, oxidation ditch, anaerobic biofilter



Central South : septic tank, anaerobic treatment, bio-contact oxidation tank, oxidation ditch, constructed wetlands, lagoon, floating.



Southeast: septic tank, anaerobic biofilter, anaerobic digesters, biological contact oxidation tank, oxidation ditch, constructed wetlands, ecological filter.

Demonstration Project

- Cluster System for a village



全国村庄污水处理案例集

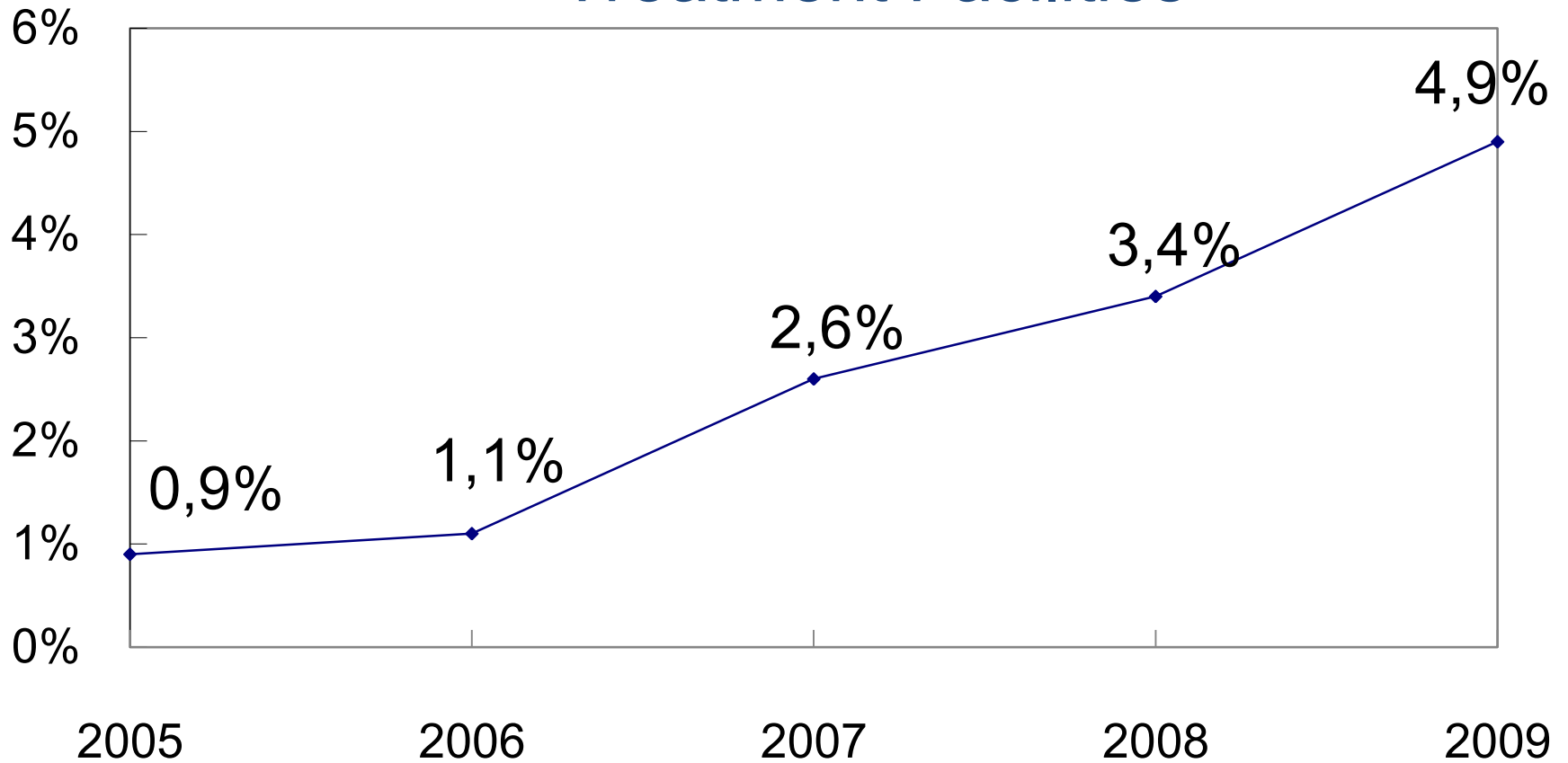


住房和城乡建设部
二零一零年一月

- Decentralized system for single family



Ratio of Villages Which Have Wastewater Treatment Facilities



Thanks for your attention!

