



Standardization of on-site treatment in China

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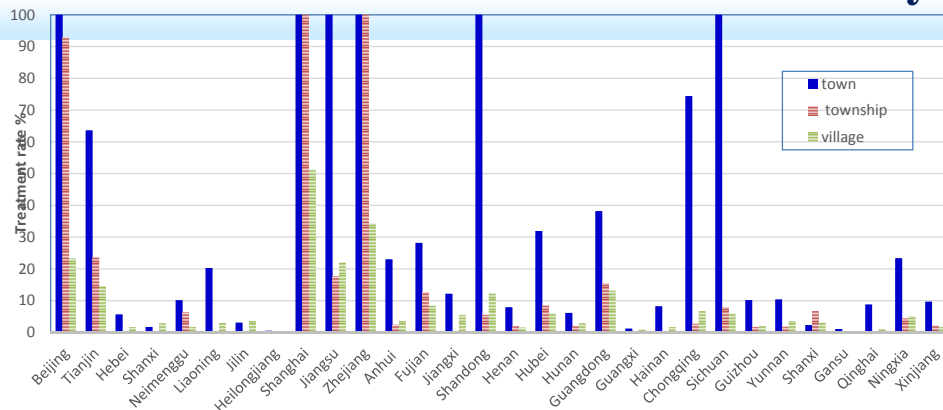
North Center for Rural Wastewater Treatment Technology
Research
Ministry of Housing and Urban-Rural Development, China

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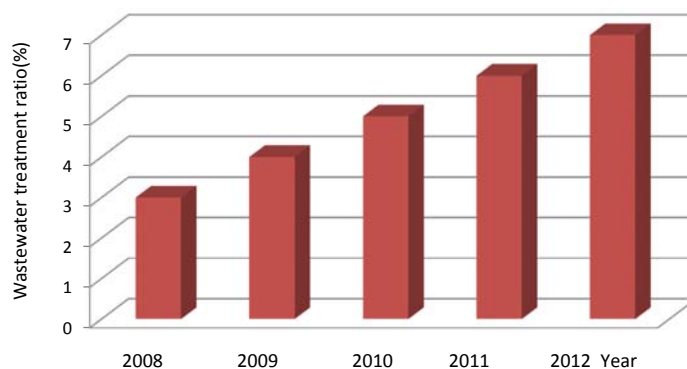
standards of on-site wastewater treatment



Domestic wastewater treatment rate in 2011year



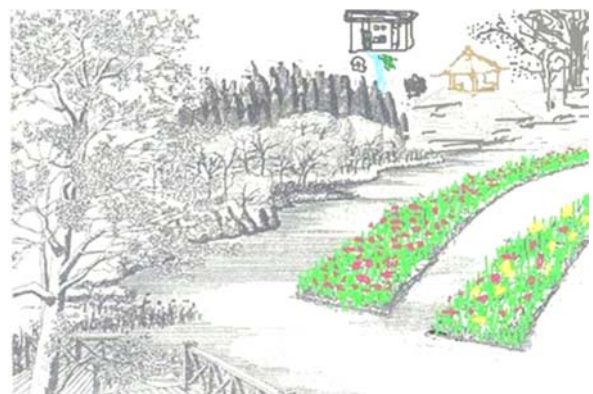
Up to the end of 2010, **22.9%** of domestic wastewater from towns and villages



wastewater treatment ratio with **1%** increasing every year

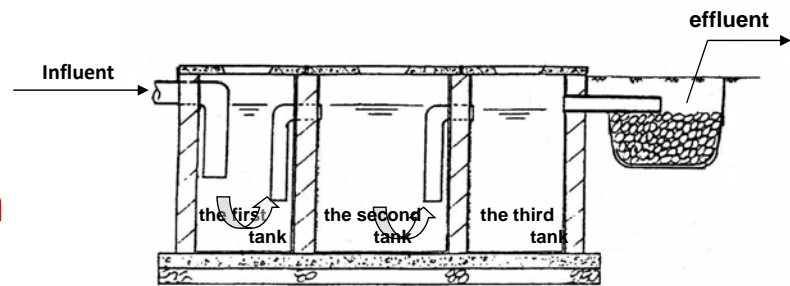
Situation

- **Diversity**
- **Management**
 - **Who is responsible? Typically homeowner for onsite, Inadequate methods of needs assessment**
 - **Standardization**



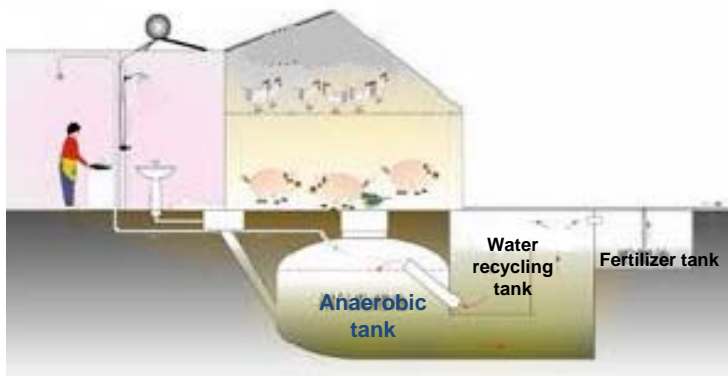
Case study: Septic tank

- Inexpensive
- Simple to maintain

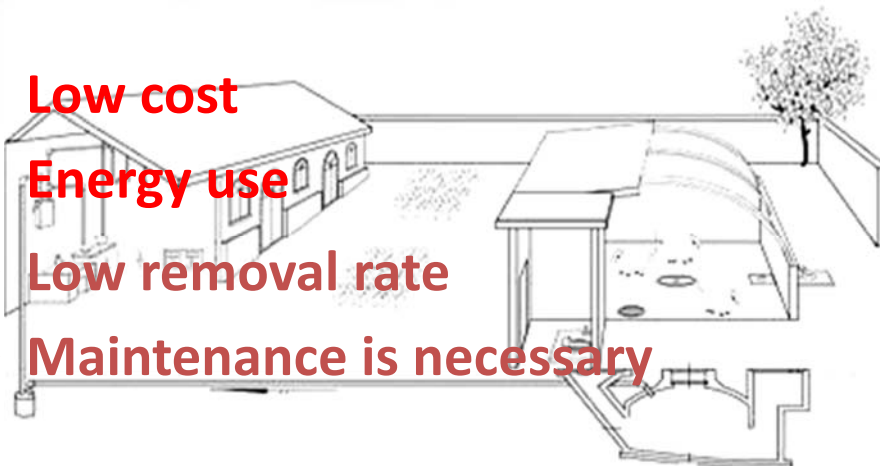


- Sludge may cause an odor problem
- Not effective in removing nitrate and phosphorus and pathogenic organics
- Potential pollution source of groundwater

Case study: Anaerobic Treatment



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



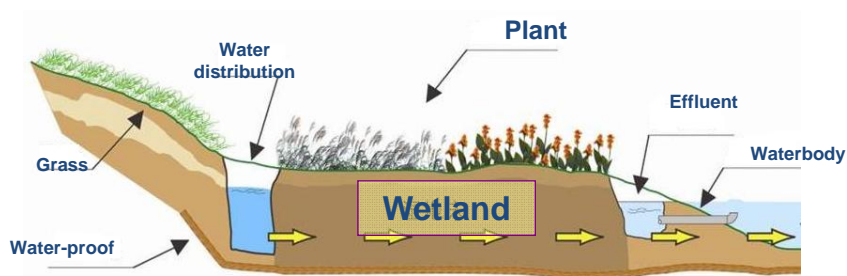
Case study: Activated sludge



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

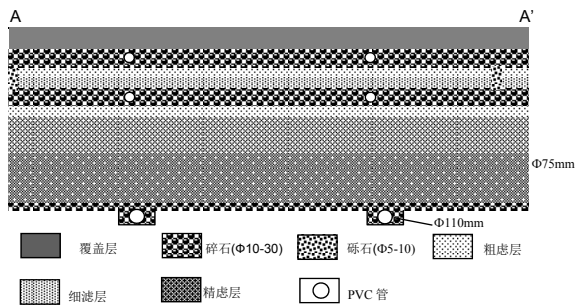


Small-scale decentralized system

0.2-5m³/d

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

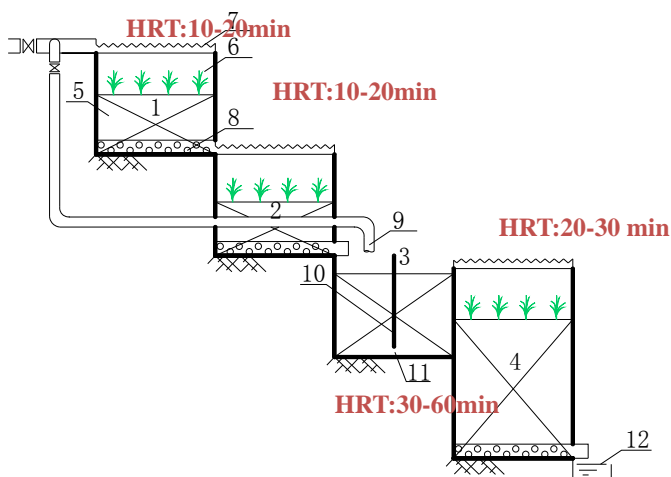
Case study: Leach Trenches



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



Case study: anaerobic tank+ ladder eco-filter

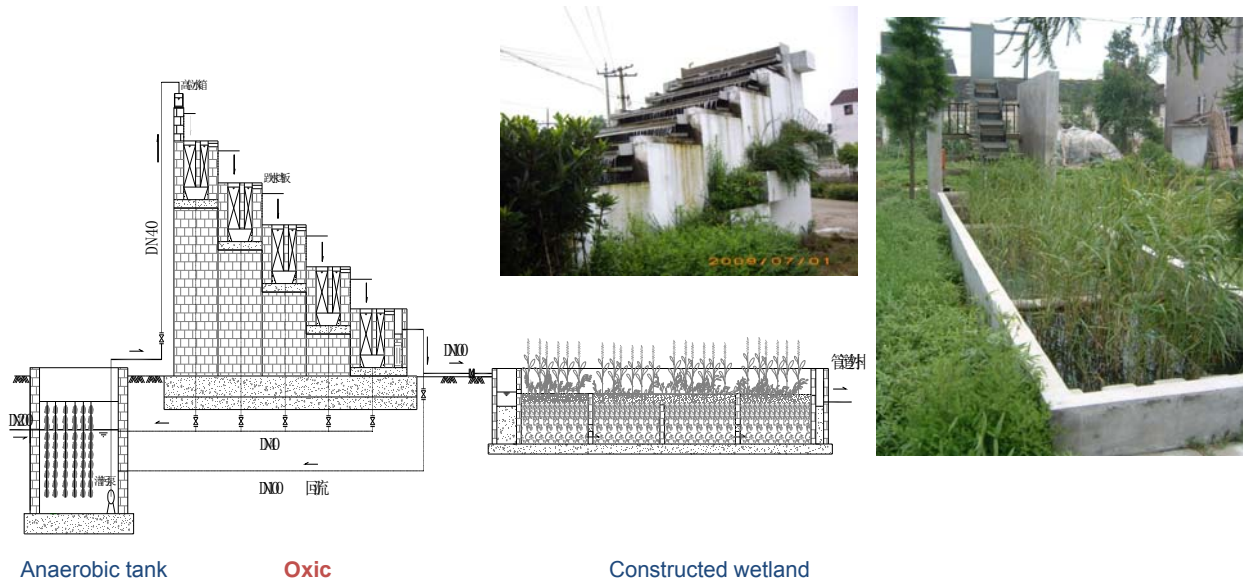


- Energy save
- Amonium and phosprous removal
- Odor

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



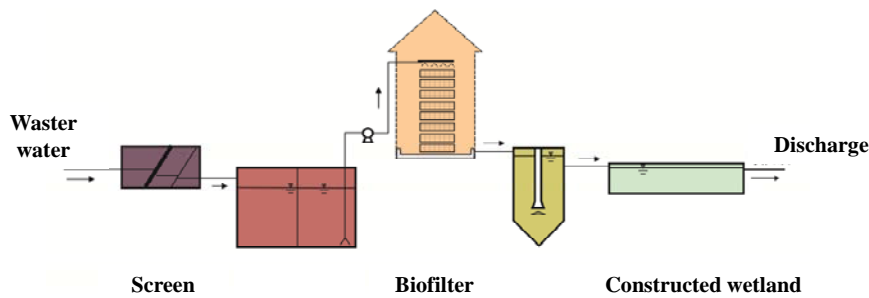
Case study: Bio- rotation + vegetable tank

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



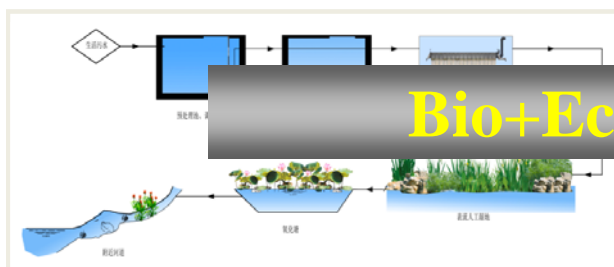
Decentralized wastewater systems

For COD removal



Aeration process

For nitrogen removal



Bio+Eco Treatment

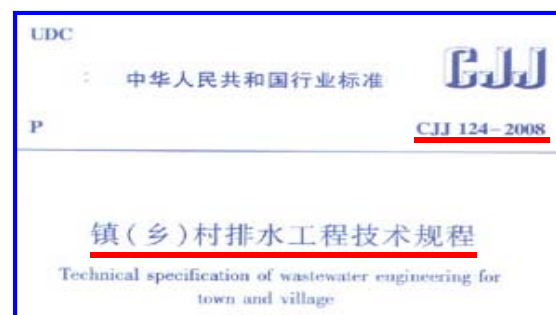
Ecological toilet

Separation of fecal and urine



Standard system of on-site wastewater treatment

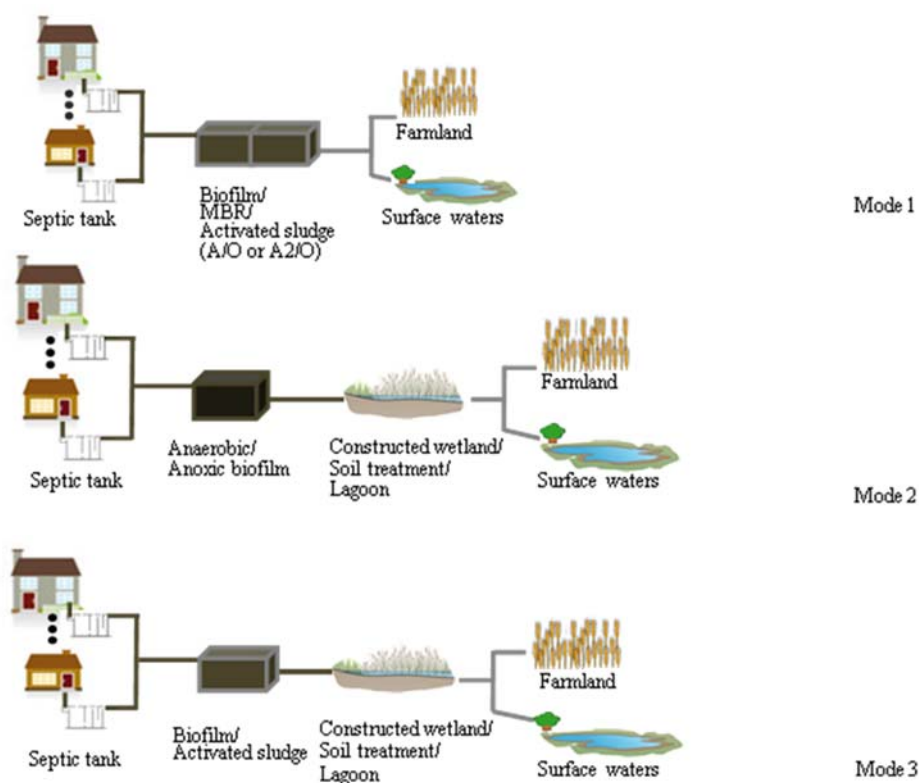
- ☑ Technique code for village rehabilitation (GB-50445-2008)
- ☑ Technical specification of wastewater engineering for town and village (CJJ124-2008)
- ☑ Technical Specification of wastewater treatment facilities for village (CJJ/T163-2011)
- ☑ Complete equipment for domestic wastewater plant (CJ/T 355-2010)
- ☑ Technical guide for rural domestic wastewater treatment in different regions



Technical Specification of wastewater treatment facilities for village (CJJ/T163-2011)



Main models of on-site wastewater treatment in China



Main contents

How to choose the suitable technology for rural area?

- 1 General provisions
- 2 Terms and symbols
- 3 General requirement
- 4 Treatment technologies
 - Anaerobic biofilm tank
 - Biological contact oxidation tank
 - Biological aeration filter
 - Oxidation ditch
 - Rotating biological contactor
 - Activated-sludge process
 - Ecological treatment of wastewater
 - Chemical phosphorus removal
 - Disinfection
- 5 Wastewater treatment facilities in village
- 6 Wastewater treatment station in village
 - Wastewater treatment station for COD removal
 - Wastewater treatment station for nitrogen removal
 - Wastewater treatment station for nitrogen and phosphorus removal
- 7 Construction and acceptance of engineering quality

Main contents

Discharged standard:

- Discharge
- Reuse

Items	Grade IA	Grade IB	Grade II
COD	50	60	100
T-N	15	20	-
NH ₄ -N	5(8)	8(15)	25(30)
T-P	0.5	1	3

Unit: mg/L

3.0.3 污水的排放要求直接关系到污水处理程度和技术选择，因此，农村生活污水的排放要求需根据国家和地方的排放要求因地制宜地确定，以保证污染物消减目标的实现和降低成本。在没有排放要求的农村地区，针对地区的特征，建议按表 1 参考不同的排水去向的排放要求。

表 1 村庄污水排放执行的相关参照标准

排水用途	直接排放		灌溉用水		渔业用水	景观环境用水
参考标准	污水综合排放标准 GB8978-1996	城镇污水处理厂污染物排放标准 GB18918-2002	农田灌溉水质标准 GB5084-2005	城市污水再生利用农田灌溉用水水质 GB20922-2007	渔业水质标准 GB11607-89	城市污水再生利用景观环境用水水质 GB/T18921-2002

Technical guide for rural domestic wastewater treatment in different regions



Environmental pressure factors

Town:

Average: 5,420 capita/km²

Highest: Shanghai, Tianjin, Guangdong and Fujian, range from 10,000 to 13,000

Lowest: Gansu, Qinghai, Xinjiang, range from 2,000 to 3,000

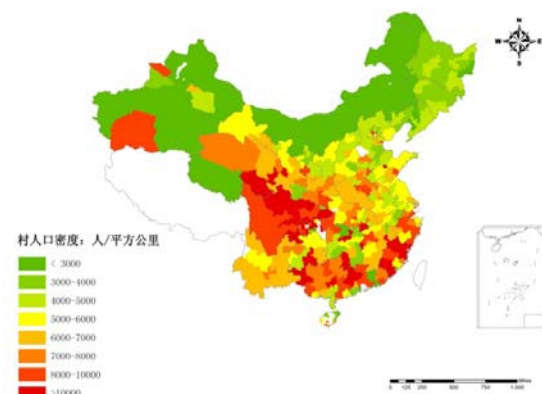
Village:

Average: 7,083/km², lower than town;

Highest: Chongqing, 25,000-33,000

Lowest: Qinghai, Gansu, 500-2,000

Population density of built-up area



Environmental pressure factors

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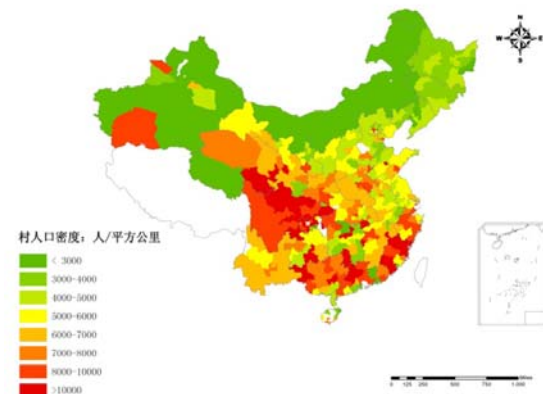
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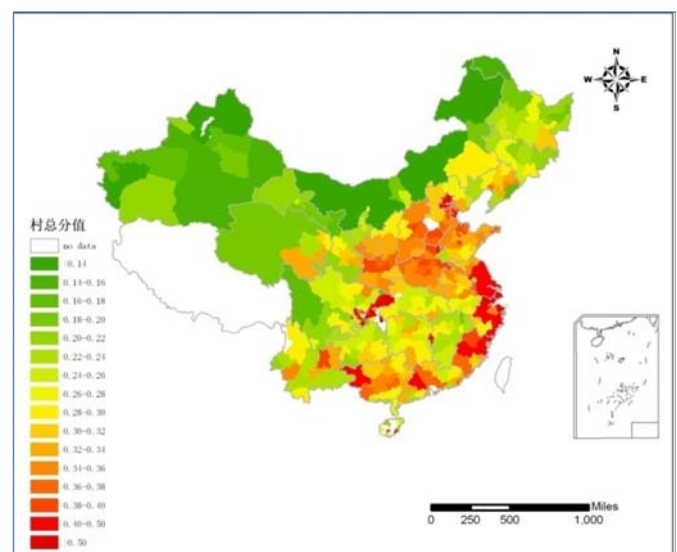
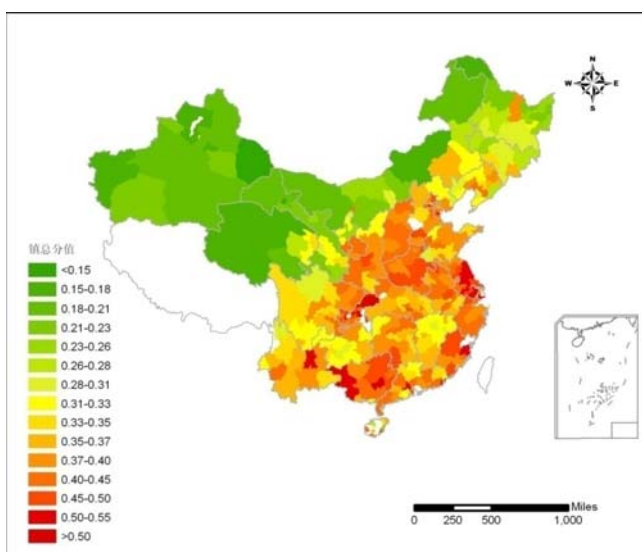
Highest: Chongqing, 25,000-33,000

Lowest: Qinghai, Gansu, 500-2,000

Population density of built-up area

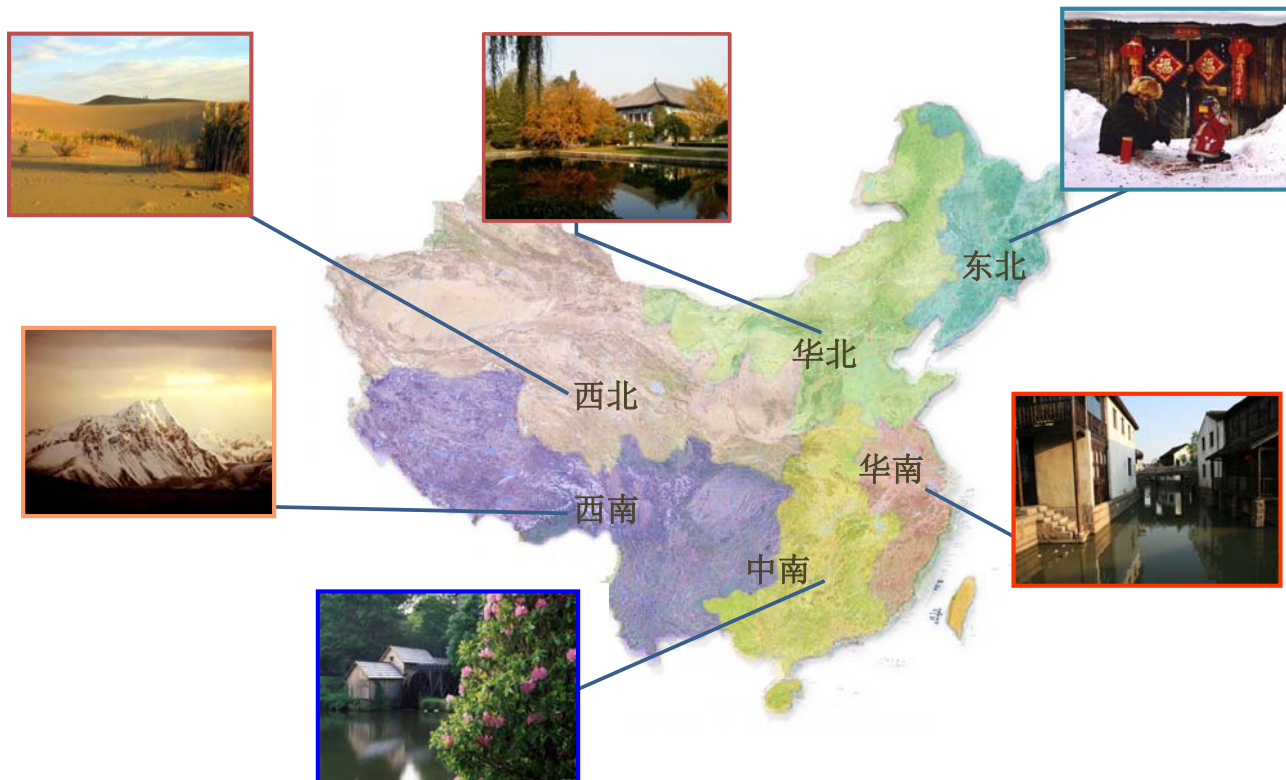


Town sewage treatment priority

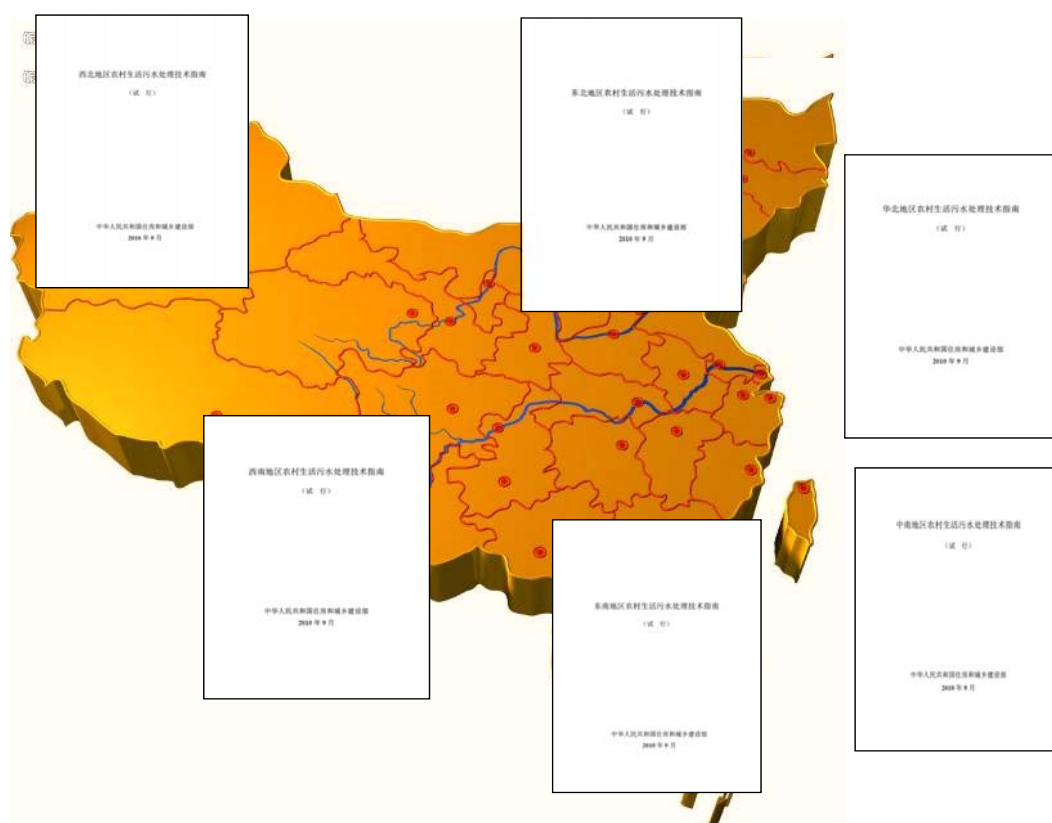


- Spatial difference is apparent. But difference is indistinctive in the priority regions between towns and villages;
- High in large area in Northern China, middle and downstream region of Yellow River.

Technical guide for rural domestic wastewater treatment in different regions



Technical guide for rural domestic wastewater treatment in different regions



Wastewater in different regions

Domestic water use (L/P.day)

Types of village	Northeast	North south	North	West north	West south	South
Good economic, bath ,flush toilet ,wash mashine	80-135	90~200	100~145	75~140	80-160	100~180
Good economic, bath and kitchen	40-90	80~100	40~80	50~90	60-120	60~120
Normal economic ,simple toilet	40-70	60~90	30~50	30~60	40-80	50~80
No flush toilet	20-40	40~70	20~40	20~35	20-50	40~60

Charactics of wastewater (mg/L)

主要指标	pH	SS	COD	BOD ₅	NH ₄ ⁺ -N	TP
West south	6.5~8.5	100-300	100-400	50-300	3-50	1.0-6.0
Northeast	6.5-8.0	150-200	200-450	200-300	20-90	2.0-6.5
North south	6.5~8.5	100~200	70~300	150~450	20~50	1.5~6.0
North	6.5~8.0	100~200	200~450	200~300	20~90	2.0~6.5
West north	6.5~8.0	150~200	150~400	100~150	20~50	2.0~6.0
South	6.5~8.5	100~200	100~300	60~150	20~80	2.0~7.0

Technical guide for rural domestic wastewater treatment in different regions



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



North China : septic tanks, sewage digesters, aeration tank, sequencing batch bio-reactor, oxidation ditch, biological contact oxidation , constructed wetlands, land treatment



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



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



Middle south: septic tanks bio-contact oxidation, oxidation ditch, constucted wetland, lagoon, floating islands could be applied for sewage treatment.



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

- Complete equipment for domestic wastewater plant (CJ/T 355-2010)
- Household sewage treatment plant (CJ/T 441-2013)

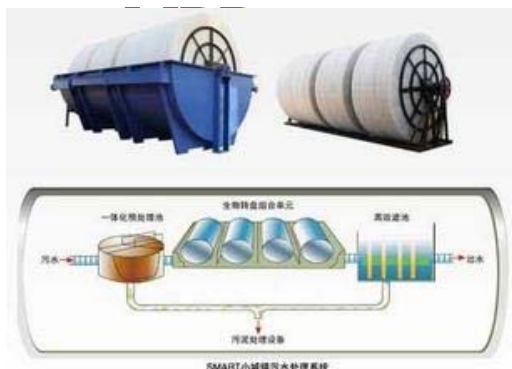


Main contents

10- 50 M³/day Facilities (CJ/T 355-2010)

Less than 2M³/day Facilities (CJ/T 441-2013)

- Discharge:
- Biofilm
- Reuse:



(资料性附录)
工艺设备的组成与要求

8.1 工艺要求

8.1.1 污水处理工艺

8.1.1.1 设备可采用传统活性污泥法、生物接触氧化法、曝气生物滤池、膜生物反应器以及其他污水处理工艺,也可采用由上述工艺中的两种或两种以上所组成的组合工艺。
8.1.1.2 当设备出水水质执行 GB 8978—1996 一排放标准时,其污水处理工艺宜选用生物接触氧化法;当设备出水水质执行 GB/T 18920 或 GB/T 18921 时,其污水处理工艺宜选用膜生物反应器。
8.1.1.3 设备宜参照 GB 50014 以及其他相关规范进行污水处理工艺设计。

8.1.2 消毒

8.1.2.1 设备应配备消毒装置。
8.1.2.2 设备的消毒方式可采用氯化消毒(消毒剂可为次氯酸钠溶液、二氧化氯等)、紫外线消毒、臭氧消毒以及其他消毒技术。
8.1.2.3 对于需要通过管道输送再生水的非现场回用情况,设备应选用氯化消毒或其他消毒技术与氯化消毒相结合的消毒方式,以确保水中余氯符合要求。

8.1.3 污泥处理处置

设备产生的剩余污泥或/和化学污泥可经生化需氧量池或专用的集泥池处理,设备内应配备排泥泵或其他排泥装置。

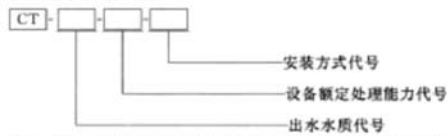
	Technologies	P	G
1	Anaerobic +biofilm	√	—
2	Anoxic- oxic biofilm	√	—
3	Anaerobic digestion	—	√
4	Anoxic/ anaerobic biofilm	—	√

a) 当设备选用生物接触氧化工艺时,宜采用斜板沉淀池作为固液分离装置;

Main contents

A.2 型号

A.2.1 设备型号以小型生活污水处理成套设备代号(CT)、出水水质代号、设备额定处理能力代号以及安装方式代号组合而成:



A.2.1.1 出水水质代号:设备出水通常可达到三种不同的水质等级,按其去向或用途执行不同的水质标准,分别以 P、Z、J 作为三种水质等级的代号。

P——出水水质执行 GB 8978—1996 一级标准;

Z——出水水质执行 GB/T 18920;

J——出水水质执行 GB/T 18921。

A.2.1.2 设备额定处理能力代号:以设备额定处理能力的数值(单位是 m^3/h)作为其代号。

A.2.1.3 安装方式代号:设备的安装方式有地上式、埋地式和移动式三种类型,分别以 D、M、Y 作为代号。

D——地上式;

M——埋地式;

Y——移动式。

A.2.2 型号示例:

CT-Z-10-D 表示:出水水质执行 GB/T 18920、额定处理能力为 $10 \text{ m}^3/\text{h}$ 、安装方式为地上式的小型生活污水处理成套设备。

A.1 分类

A.1.1 按设备装置型式可分为:

——一体式;

——分体式。

A.1.2 按设备安装方式可分为:

——地上式;

——埋地式;

——移动式。

Challenges and future



Challenges and future

- Reusing effluent for more sustainable sewage treatment practices in Chinese villages.
- **Supervision in sewage treatment facilities.** Appropriate regulatory authorities to be responsible for daily testing of water quality in sewage treatment facilities.
- Suitable disinfection processes must be applied in the rural sewage treatment process.

Thanks for your attention!

