

# Wastewater Production, Treatment, and Use in China

## I Wastewater production and treatment

According to the official statistics from the *1<sup>st</sup> National Pollutant Source Census Bulletin* published in 2010, wastewater that generated by municipal and industrial sectors were nearly to 108.16 billion cubic meters (73.83 billion m<sup>3</sup> industrial source; 34.33 billion m<sup>3</sup> domestic source)<sup>1</sup> per year.

For now, the dominant wastewater treatment types in China are 3 main varieties as follows. The primary one is regular treatment process used by physical, chemical and biological approaches, single or composite.<sup>2</sup> The secondary one is advanced treatment by means of media filtration, bio-film adsorption, photo-catalytic oxidation and so forth.<sup>3</sup> And the tertiary one is disinfection involved of chlorination, UV, O<sub>3</sub>, etc.<sup>4</sup>

The major constraints to wastewater treatment include the separation, analysis and purification of extraordinary complicated pollutant elements, immature operation level in the technological process as above regarded, meet the requirement of the condition in practical, powerful foundation for the better utilization, balance of payments, etc.

## II Wastewater use/disposal

The data from Ministry of Housing and Urban-Rural Development of the People's Republic of China (MOHURD) showed that 3,272 urban sewage treatment plants, with a treatment capacity of 140 million cubic meters per day, have been built till 9, 2012<sup>5</sup>. According to the *2<sup>nd</sup> National Environmental Quality Investigation and Statistics of Wastewater Irrigation Area*<sup>6</sup> in China (the baseline is 1995), the farmland area irrigated with treated municipal wastewater was nearly 3.618 million hm<sup>2</sup> in 1998, accounted for 7.33% of total irrigated area. While the data that irrigated with untreated, inadequately treated, diluted untreated and/or uncollected wastewater was unavailable because of the prohibition. This is the latest data issued by the government till now.

In those areas irrigated with wastewater, the major crops and crop rotations are not same in different climatic conditions and customs. The most universal crops are wheat, rice and corn, while cotton, sorghum and potatoes are common in some areas. And the major crop rotations are winter wheat and summer corn, or winter wheat and summer cotton.

---

<sup>1</sup> 1<sup>st</sup> National Pollutant Source Census Bulletin (2007)

<sup>2</sup> The Urban Sewage Recycling Technology Guide (2012)

<sup>3</sup> The Urban Sewage Recycling Technology Guide (2012)

<sup>4</sup> The Urban Sewage Recycling Technology Guide (2012)

<sup>5</sup> Bulletin of Construction and operation of National Urban sewage treatment facilities (9, 2012)

<sup>6</sup> 2<sup>nd</sup> National Environmental Quality Investigation and Statistics of Wastewater Irrigation Area

### III Policies and institutional set-up and needs for wastewater management

China issued the official institution named of Technology and Policy of *Municipal Sewage Treatment and Pollution Prevention and Control*<sup>7</sup> in 2000. There are a series of specific regulations and approaches about wastewater collection, treatment, disposal and recycling utilization for many purposes including environmental protection, resource conservation and recycling, industrial sustainable development, biological and ecological security and healthy, etc. Additionally, more than 10 sets of national standards (GB)<sup>8, 9, 10, 11, 12</sup> and guidelines<sup>13</sup> for the safety utilization of wastewater illustrated the principle, formulation, requirement, monitoring and analyzing index regarding to the farmland irrigation respectively. For instance, 200 m protected zone between the irrigated area and residential area is extremely obligatory. 500 m distance far away from the spray irrigation zone to the residential area is also imperative in case the pathogen within the water spray diffused.

Incidentally, China has thousands years of developing history in agriculture with all varieties of characteristics whatever in the southeast, northwest, coastal line, inland region of the country. Thus, different area has different forms, modes, approaches, processes for the improvement of agricultural sustainable development. Wastewater treatment and utilization is not the exception either.

In the light of the national guidelines in hand, the implementation in the large-scaled farmlands as well as the facility sheds in the relatively developed areas is better than the developing areas due to the advanced managing level and normalization. Anyhow, national or modifying international guidelines have to meet the requirement of Chinese condition and situation at the bottom.

Chinese government enacted the *Agricultural Products Safety Law of the People's Republic of China*<sup>14</sup> in 2006 and the *Implementation Regulation of Food Safety Legislation of the People's Republic of China*<sup>15</sup> in 2009, respectively. The main items

---

<sup>7</sup> Technology and Policy of Municipal Sewage Treatment and Pollution Prevention and Control (2000)  
[http://kjs.mep.gov.cn/hjbhzbz/bzwb/wrfzjszc/200903/t20090303\\_134820.htm](http://kjs.mep.gov.cn/hjbhzbz/bzwb/wrfzjszc/200903/t20090303_134820.htm)

<sup>8</sup> Standards for Irrigation Water Quality (GB 5084-92)

<sup>9</sup> Technology Code for Municipal Wastewater Reuse in Agriculture (GB/T 22103-2008)

<sup>10</sup> The Reuse of Urban Recycling Water-Quality of Farmland Irrigation Water (GB 20922-2007)

<sup>11</sup> The Reuse of Urban Recycling Water-Water Quality Standard for Industrial Uses (GB/T 19923-2005)

<sup>12</sup> The Reuse of Urban Recycling Water-Water Quality Standard for Scenic Environment Use (GB/T18921-2002)

<sup>13</sup> Guideline of Urban Sewage Treatment and Pollution Prevention and Control Technology (Ministry of Environmental Protection, 2001)

<sup>14</sup> Agricultural Products Safety Law of the People's Republic of China (2006)

<sup>15</sup> Implementation Regulation of Food Safety Legislation of the People's Republic of China (2009)

covered security criteria of agro-products quality and producing area, production and operation, packing and identification, monitoring, evaluation and inspection, legislative responsibility are totally stated in the 2 laws. The quality control over the wastewater-irrigated produce/products was severely implemented under the legal framework. In addition, a series of pertinent monitoring and management approaches<sup>16</sup> for the agro-products quality safety are also issued by the central and local administrative divisions in agriculture. For example, the Ministry of Agriculture (MOA) drafted a practical guideline<sup>17</sup> about the concrete implementation of monitoring criteria of agro-products quality safety and security certification management. In the technical code<sup>18</sup>, non-food agro-products from the irrigated area need to carry out relevant criteria relying on their purpose while the edible ones have to pass the overall inspection by agricultural testing departments in order that get the criteria certification of quality safety. And then, the products will be permitted to access to the market. Anyway the aim is to further improve the handling, marketing and freely running in available.

#### **IV Research/practice on different aspects of wastewater**

The government of China does not advocate that wastewater used in farmland from about 2000. However state and local governments still support some research projects on reclaimed water irrigation (basically meet GB 5084-2005), such as follow links.

[http://www.most.gov.cn/kjbgz/200607/t20060717\\_34879.htm](http://www.most.gov.cn/kjbgz/200607/t20060717_34879.htm)

[http://www.gov.cn/fwxx/kp/2005-12/07/content\\_120212.htm](http://www.gov.cn/fwxx/kp/2005-12/07/content_120212.htm)

<http://www.jsgg.com.cn/Index/Display.asp?NewsID=10410>

<http://www.022net.com/2009/6-19/50263629272762.html>

#### **VI Status and need for the knowledge and skills on the safe use of wastewater**

Many studies showed rational management of the municipal and industrial wastewater played a key role for not only dealing with the shortage of agricultural water resources, but also improving the regional agricultural sustainable development as well.<sup>19, 20, 21, 22</sup>

---

<sup>16</sup> Monitoring and Management Approaches for the Agro-products Quality Safety (Ministry of Agriculture of the People's Republic of China, 2012)

<sup>17</sup> Practical Manual of the Implementation of Monitoring Criteria of Agro-products Quality Safety and Security Certification Management (MOA, 2009)

<sup>18</sup> Technology Code for Municipal Wastewater Reuse in Agriculture (GB/T 22103-2008)

<sup>19</sup> ZHANG HW, SUN T, ZHANG ZW, *et al.* 2009. Spatial variability characteristics of soil nutrients in wastewater irrigated mountain garden in arid desert area. *Journal of Agro-Environmental Science* 28 (6): 1164-1171.

<sup>20</sup> ZHANG J, ZHANG HW, ZHANG Q, *et al.* 2008. Impact of long-time irrigation of petroleum wastewater on glebe microbial biomass and soil enzyme activities in Northeast China. *Chinese Journal of Eco-Agriculture* 16 (1): 67-70.

So how to scientifically use the wastewater in the farmland irrigation either in technical level or in administrative level has been a complicated and rigorous task for years. Scientific researchers should convene the core power in this field to further probe into the fundamental theory integrated with the practical investigation systematically and profoundly. In theory, the movement, transformation and accumulation rule of contaminated harmful, toxic ingredients and elements going through the soil-water-plant system will be covered. In practically, different sources of wastewater combined with different irrigation patterns that influenced on the crop growing, physical and chemical property of the soil and microorganism activities are in urgent need with real-time monitoring and evaluation.

## References

- 1<sup>st</sup> National Pollutant Source Census Bulletin (2007)
- The Urban Sewage Recycling Technology Guide (2012)
- The Urban Sewage Recycling Technology Guide (2012)
- The Urban Sewage Recycling Technology Guide (2012)
- Bulletin of Construction and operation of National Urban sewage treatment facilities (9, 2012)
- 2<sup>nd</sup> National Environmental Quality Investigation and Statistics of Wastewater Irrigation Area Technology and Policy of Municipal Sewage Treatment and Pollution Prevention and Control (2000) [http://kjs.mep.gov.cn/hjbhzbz/bzwb/wrfzjszc/200903/t20090303\\_134820.htm](http://kjs.mep.gov.cn/hjbhzbz/bzwb/wrfzjszc/200903/t20090303_134820.htm)
- Standards for Irrigation Water Quality (GB 5084-2005)
- Technology Code for Municipal Wastewater Reuse in Agriculture (GB/T 22103-2008)
- The Reuse of Urban Recycling Water-Quality of Farmland Irrigation Water (GB 20922-2007)
- The Reuse of Urban Recycling Water-Water Quality Standard for Industrial Uses (GB/T 19923-2005)
- The Reuse of Urban Recycling Water-Water Quality Standard for Scenic Environment Use (GB/T18921-2002)
- Guideline of Urban Sewage Treatment and Pollution Prevention and Control Technology (Ministry of Environmental Protection, 2001)
- Agricultural Products Safety Law of the People's Republic of China (2006)
- Implementation Regulation of Food Safety Legislation of the People's Republic of China (2009)
- Monitoring and Management Approaches for the Agro-products Quality Safety (Ministry of Agriculture of the People's Republic of China, 2012)

---

<sup>21</sup> GUO XM, MA F, CHEN LZ, *et al.* 2012. Characteristics of fertility and enzyme activity of soils in sewage irrigated fields. *Ecology and Environmental Sciences* 21 (1): 78-83.

<sup>22</sup> ZHANG HW, MA JY, CHEN FH, *et al.* 2008. Investigation of the spatial variability of fertility in wastewater irrigated soils in Yamalic Mountain, Urumqi, China. *Journal of Arid Land Resources and Environment* 22 (8): 185-191.

Practical Manual of the Implementation of Monitoring Criteria of Agro-products Quality Safety and Security Certification Management (MOA, 2009)

Technology Code for Municipal Wastewater Reuse in Agriculture (GB/T 22103-2008)

ZHANG HW, SUN T, ZHANG ZW, *et al.* 2009. Spatial variability characteristics of soil nutrients in wastewater irrigated mountain garden in arid desert area. *Journal of Agro-Environmental Science* 28 (6): 1164-1171.

ZHANG J, ZHANG HW, ZHANG Q, *et al.* 2008. Impact of long-time irrigation of petroleum wastewater on glebe microbial biomass and soil enzyme activities in Northeast China. *Chinese Journal of Eco-Agriculture* 16 (1): 67-70.

GUO XM, MA F, CHEN LZ, *et al.* 2012. Characteristics of fertility and enzyme activity of soils in sewage irrigated fields. *Ecology and Environmental Sciences* 21 (1): 78-83.

ZHANG HW, MA JY, CHEN FH, *et al.* 2008. Investigation of the spatial variability of fertility in wastewater irrigated soils in Yamalic Mountain, Urumqi, China. *Journal of Arid Land Resources and Environment* 22 (8): 185-191.