

Summary of the typical ecological and environmental issues that are prone to occur during the operation of enterprises in the Yellow River Basin

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Abstract: The biggest contradiction in the Yellow River Basin is the shortage of water resources, and the most urgent issues are ecological fragility and severe pollution. This article summarizes typical ecological and environmental issues that are prone to occur during the operation of enterprises around the Yellow River Basin, such as exhaust gas, wastewater discharge, and solid waste management. It is hoped that this article can serve as a reminder and warning to polluting enterprises in the Yellow River Basin and provide ideas for how to properly manage them in the future.

1. The current status of the ecological environment in the Yellow River Basin

1.1. Composition of the river system in the Yellow River Basin

The Yellow River, with a total length of 5,464km, is the second largest river in China^[1,2](Figure 1). Originating from the Yoguzonglie Basin at the northern foothills of the Bayan Har Mountains on the Qinghai-Tibet Plateau, the Yellow River flows through nine provinces and autonomous regions, including Qinghai, Sichuan, Gansu, Ningxia, Inner Mongolia, Shanxi, Shaanxi, Henan, and Shandong, before emptying into the Bohai Sea in Kenli County, Shandong Province. The Yellow River has numerous tributaries, with 76 primary tributaries having a catchment area greater than 1,000 square kilometers (43 upstream, 30 midstream, and 3 downstream), and 10 primary tributaries having a catchment area greater than 10,000km² [3].

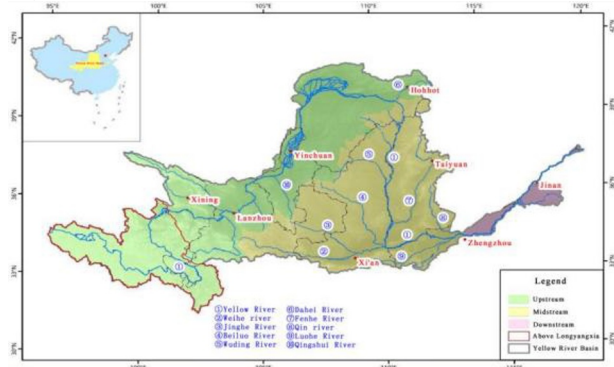


Figure 1. Yellow River Basin Range Map

1.2. Water resources situation in the Yellow River Basin

Precipitation is low and generally decreases from the southeast to the northwest(Figure 2). The Yellow River Basin is one of the basins with the least precipitation in China, with an average annual precipitation of only 447mm, far lower than the national average of 628mm and the Yangtze River Basin's 1205mm^[4]. Water resources are primarily surface runoff, with upstream runoff accounting for more than 60%. July, August, September, and October are the four months with the highest runoff in the year, accounting for more than 60% of the annual runoff^[5].

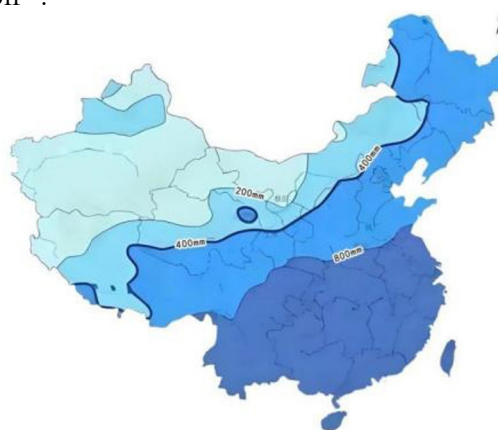


Figure 2. Contour lines of average annual precipitation in China (1981~2010)

1.3. Water environment status of the Yellow River Basin

The overall water quality of the Yellow River Basin is excellent. The water quality of the main stream has

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remained at Grade II for three consecutive years(Figure 3). In 2024, the proportion of Grade I-III sections in the Yellow River Basin was 90.4%(Figure 4), and the proportion of inferior Grade V sections was 1.5% (0% after deducting the background value) (Figure 5). In 2024, the proportion of rivers with excellent water quality (Grade I-III) in the Yangtze River Basin ranked sixth among the seven major river basins, as well as the rivers in the southwest, northwest, and Zhejiang-Fujian regions.

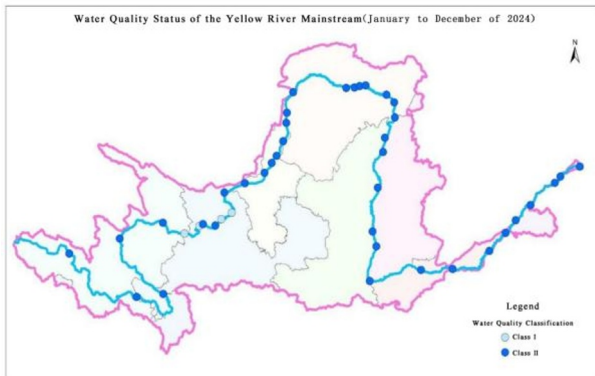


Figure 3. Water Quality Status of the Yellow River Mainstream

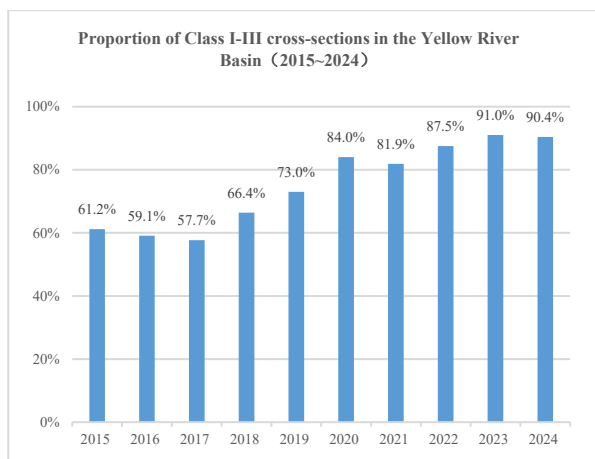


Figure 4. Proportion of Class I-III cross-sections in the Yellow River Basin

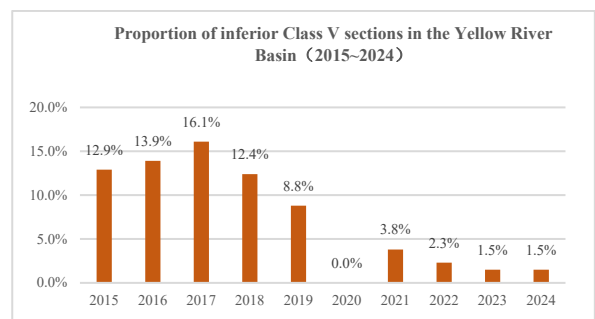


Figure 5. Proportion of inferior Class V sections in the Yellow River Basin

2. The main contradiction between enterprises and the environment around the Yellow River Basin

2.1. Main types of enterprises in the Yellow River Basin

Key industries such as coal mining and beneficiation, as well as coal chemical industry, have a high proportion (60% in terms of the number of enterprises and 70% in terms of output value), and there is a serious agglomeration of coal chemical enterprises(Figure 6). Provinces such as Gansu, Shaanxi, Inner Mongolia, Henan, and Qinghai have many historical issues of heavy metal pollution in non-ferrous metal mining areas, which are difficult to resolve. The stockpile of solid waste from mines in the Yellow River Basin has reached 18.48 billion tons, accounting for 31.88% of the national total, with over 20,000 historical mine patches.

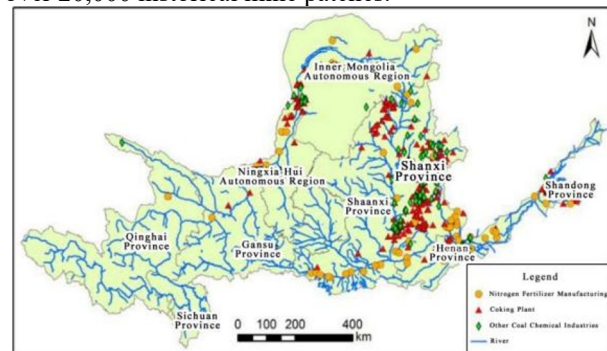


Figure 6. Distribution map of coal chemical enterprises in the Yellow River Basin

2.2. Overexploitation and Utilization of Water Resources in the Yellow River Basin

The Yellow River has an average annual total water resource of 58.4 billion cubic meters^[6], accounting for only 6% of the Changjiang River. The basin is home to 12% of the country's population and 15% of its arable land, with a per capita water resource of less than 500 cubic meters, making it a region with shortage of water resources. The development and utilization rate of water resources is as high as 80%, ranking second among the top 10 basins in China and far exceeding the ecological warning line of 40%.

Therefore, controlling environmental pollution from enterprises is crucial around the Yellow River Basin. Based on this purpose, the first step is to accurately identify ecological and environmental issues.

3. Key points for identifying ecological and environmental issues from enterprises

Basic requirements: Polluting enterprises should construct, operate, and maintain pollution prevention and control facilities in accordance with ecological and environmental management requirements, establish

relevant environmental management systems, strictly control the discharge of pollutants, and shall not discharge pollutants in excess of the permitted emission concentration and quantity.

Environmental protection goal: Up to standard discharge of exhaust gas and industrial waste water. Solid waste should be disposed in accordance with laws and regulations.

3.1. Exhaust gas

The focus is on 11 aspects, including : (1) Direct discharge without constructing pollution control facilities. (2) Inadequate collection and treatment of flue gas (exhaust gas). (3) Pollution control facilities are not operating normally. (4) Excessive (over total) emissions of exhaust gas. (5) Emission of atmospheric pollutants by evading supervision. (6) Mismanagement of uncontrolled emission of exhaust gas or dust. (7) Inadequate response to severe air pollution weather. (8) Poor dust control at the construction site. (9) Fraudulent practices in carbon emissions. (10) Failure to eliminate non-road mobile machinery and equipment as required. (11) Operation and maintenance of pollution source automatic monitoring systems.

For example, (1) **Coal yard:**The coal yard in power plant should be fully enclosed (Figure 7). If it cannot be enclosed, coal yard should be equipped with windbreak dust suppression nets to prevent uncontrolled emission of exhaust gas from coal dust. The height of the windbreak dust suppression nets meet the requirement should be higher than 1.1 times the height of the stored coal (Figure 8). At the same time any obvious damages can't be existed on the windbreak dust suppression nets. (2) **Ash yard:** The ash yard should spray water, roll the ash during stacking and cover with dustproof net to prevent uncontrolled emission of exhaust gas from dust(Figure 9). (3) Automatic monitoring systems: A company was suspected of falsifying automatic monitoring data. In the industrial computer flue gas automatic monitoring operation system of the enterprise, the sulfur dioxide function formula in the operation database had a setting of "-55", resulting in SO₂ measurement values being 55mg/m³ lower than the values uploaded to the ecological environment department.

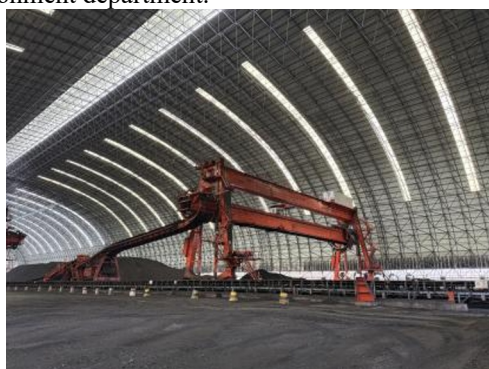


Figure 7. Enclosed coal yard



Figure 8. Opened coal yard with windbreak dust suppression nets

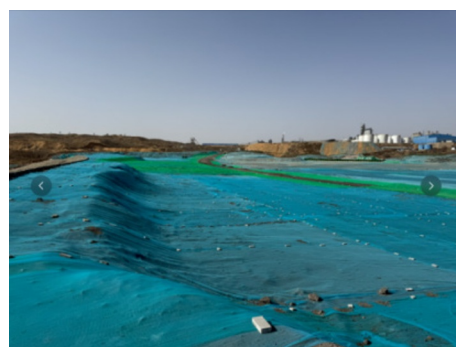


Figure 9. Covering with dustproof net in the ash yard

3.2. Wastewater discharge

The focus is on 5 aspects, including : (1) Direct discharge without constructing wastewater treatment facilities. (2) The wastewater treatment facilities are not operating normally. (3) Excessive wastewater discharge (exceeding the total allowance). (4) Discharge wastewater by evading supervision. (5) Illegal facilities discharging into river outlets.

For example, in a case of illegal discharge from a coal mine: surnamed Lin arranged for staff to directly discharge untreated black coal slurry water into the underground river system through a concealed pipe. After being reported by the public, Procuratorate imposed administrative penalties on the coal mine and supervised its rectification.

3.3. Disposal of solid waste

The focus is on 8 aspects, including : (1) Unauthorized dumping and piling of hazardous waste. (2) Illegal transfer of hazardous waste. (3) Providing or entrusting hazardous waste to unlicensed units or other production operators for business activities. (4) No measures such as anti-scattering, anti-loss, and anti-leakage have been taken in the temporary storage room for hazardous waste. (5) Failing to take protective measures that meet national environmental protection standards when storing industrial solid waste. (6) Illegal dumping and disposal of construction waste. (7) The storage facilities for mining solid wastes such as tailings, coal gangue, and waste rocks are not sealed as required after they are no longer in use.

(8) The unit generating industrial solid waste has not established a solid waste management ledger and failed to record truthfully.

For example, the management of hazardous waste was not standardized in a certain power plant. A large number of waste paint buckets were disorderly stacked in warehouses without doors and impermeable floor, resulting in local soil pollution and potential contamination of groundwater (Figure 10). Above situation does not comply with Article 79 of the Solid Waste Pollution Prevention and Control Law of the People's Republic of China^[7], which states that “units that generate hazardous waste shall store, utilize, and dispose of hazardous waste in accordance with relevant national regulations and environmental protection standards, and shall not dump or pile up hazardous waste without authorization”.



Figure 10. Waste paint buckets were disorderly stacked in warehouses without doors and impermeable floor

4. Suggestions for investigating ecological and environmental issues from enterprises

Enterprises are important pillars of the national economy and key forces in achieving national strategic goals. They must enhance their political awareness and sense of responsibility, and take the lead in promoting ecological protection and high-quality development of the Yellow River Basin.

(1) When planning corporate development strategies, it is essential to integrate the concept of green development, giving priority to environmental standards and technological upgrades, reducing pollution emissions, and enhancing resource utilization efficiency.

(2) Increase investment in scientific research, explore and apply new technologies and materials for energy conservation and emission reduction, support the development of clean energy, promote the transformation of traditional industries towards green and low-carbon development.

(3) Ensure effective follow-up after rectifying identified hazards. Enterprises should regularly carry out identification of environmental impact factors and risk point investigations, and promptly rectify any identified issues. For identified issues, it is necessary to formulate detailed rectification plans, specifying rectification objectives, timelines, specific measures, and responsible

individuals. Ensure that each issue has a specific solution plan, and track the implementation until it is fully resolved.

5. Conclusions

In the ongoing and in-depth battle against environmental pollution, enterprises should fulfill responsibilities and ensure effective management of various pollutants such as exhaust gas, wastewater, and solid waste during the operational phases of enterprises. Enterprises should regularly conduct identification work on ecological and environmental issues. At the same time enterprises should promptly rectify any problems identified, and ultimately achieve compliance with laws and regulations, further promoting ecological and environmental protection and continuously improving the ecological and environmental quality of the Yellow River Basin.

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