On the Temporary Land Reclamation of Liyang – Guangde Expressway (Anhui Section)

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Abstract This paper analyzes the temporary land type, distribution and area of Liyang – Guangde Expressway (Anhui section), and based on the natural conditions of regions that the expressway runs through, predicts the degree of damage to different types of temporary land, and designs the reclamation mode according to local conditions.

Key words Liyang – Guangde Expressway, Temporary land, Reclamation mode

With the advance of industrialization and urbanization, the scale and speed of expressway construction have been accelerated. There are two types of land occupied by the expressway: one is the land occupied permanently, namely the land used for the construction of expressway itself, including the land for roadbed, green corridor and service area; the other is the temporary land, namely the land providing temporary services for the expressway construction, including the land for bridges, temporary passage, borrowing pits, dumping area and living area for the road constructors, and this land must be given back to the original land owners or users after the expressway is built[2].

According to the provisions of *Land Management Law*, the land permanently occupied is expropriated, and the temporary land is requisitioned. According to *Land Reclamation Regulations*, the damaged land temporarily occupied for the building of energy, transportation and water conservancy infrastructure and other production and construction activities, must be reclaimed by the person responsible for the reclamation of land, who should submit the land reclamation program along with the relevant materials when going through the procedure of applying construction land or mining rights[1].

Therefore, before the application of expressway construction project, it is necessary to assess the scale, type and location of land temporarily occupied by the expressway, as well as the degree of damage to different types of temporary land, based on planning and design and the natural conditions of regions that the expressway runs through.

Then there is a need to develop the reclamation programs to achieve the purpose of restoring the production and ecological functions of temporary land as soon as possible after the expressway is built[3].

Received: April 1, 2014 Accepted: May 7, 2014
Supported by the New Expressway Temporary Land Reclamation Mode and Technical Research Funding in Anhui Province.
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Based on this, with Liyang – Guangde Expressway (Anhui section) as the object of study, this paper studies the temporary land reclamation of the expressway, in order to provide a useful reference.

1 Overview of Liyang – Guangde Expressway (Anhui section) and regions that the expressway runs through

1.1 Overview of Liyang – Guangde Expressway (Anhui section) The length of Liyang – Guangde Expressway (Anhui section) is 38.776 km, covering 372.6863 ha land (254.4667 ha permanent land and 118.2196 ha temporary land).

The two-way four-lane expressway began to be built in 2013, with the design speed of 120 km/h. 3 intercommunicated overpasses, 1 mainline toll station and 14 bridges are set up. It is expected to be opened to traffic in 2016.

The whole lines is designed and constructed in accordance with the plain and hilly area expressway standards. According to the provisions of *Land Management Law*, *Land Reclamation Regulations* and other laws and regulations, before the construction of expressway and its temporary land, 20 cm thick soil must be taken from the farmland occupied for reclaiming the land or increasing the fertility of low-yielding land.

1.2 Overview of regions that the expressway runs through Liyang – Guangde Expressway (Anhui section) runs through Langxi County and Guangde County of Xuancheng City. The terrain of regions that the expressway runs through, slopes to northwest. The northern and central parts are mainly the plain, while the southern part and eastern edge are mainly the undulating hillock, hill and low mountains.

Langxi County is located in the southeast of Anhui Province, the western margin of the Yangtze River Delta, and the junction of Anhui, Jiangsu and Zhejiang provinces, with superior location. The county's total land area is 1104.8 square kilometers, and the terrain is narrow in the south and wide in the north.

The northern and central parts are mainly the plain along the mainstream and tributaries of Langchuan River; the southern part

and eastern edge are undulating hillock, hill and low mountains. This county has jurisdiction over 7 towns and 2 townships, with a total population of 2778000. In 2011, the GDP reached 25.25 billion yuan, and the ratio of three industries was 16:62.6:4.

Guangde County is a county in Anhui Province, under the jurisdiction of Xuancheng City. Guangde County has jurisdiction over 6 towns and 10 townships. The county has a population of 510000 and an area of 2165 square kilometers.

The seat of government is at Taozhou Town. The southern part is mainly low mountains, the central part is mainly hillock and plain, and the northern part is mainly hill. In 2011, the GDP reached 12 billion yuan, and the ratio of three industries was 11.2:48.8:40.

2 The temporary land type of Liyang – Guangde Expressway (Anhui section) and its reclamation mode

2.1 The use and scale of temporary land According to *Preliminary Design Report on Yangzhou – Jixi Expressway (Liyang – Guangde Anhui Section)*, the total scale of temporary land is 118.219 6 ha in this project, mainly used for borrowing pits, dumping area, construction site and construction road (Table 1).

Table 1 Current use of temporary land of Liyang – Guangde Expressway (Anhui section) Unit: ha

Land type	Borrowing pits	Dumping area	Construction site	Construction road	Total
Arable land	33.6756	5.3678	3.8309	22.5253	65.3996
Garden plot	7.4893	0.7655	0	0	8.2548
Woodland	32.2838	5.4471	2.6639	0	40.3948
Transportation land	0.4783	0	0.0400	0	0.5183
Waters and water conservancy facility land	1.6387	0.6762	1.3372	0	3.6521
Total	75.5657	12.2566	7.8720	22.5253	118.2196

2.2 Reclamation mode of temporary land The expressway is a line type project, and there are great differences in the natural conditions between the regions that the expressway runs through[3].

Therefore, in the construction process, even for the same type of temporary land, the extent of damage is different, and the direction of its reclamation is also different. This is will objectively require the reclamation mode of temporary land to suit local circumstances.

2.2.1 The terrace-type reclamation mode of "crushed stone backfilling + deep digging and shallow filling". This mode applies to the borrowing pits. There are 11 borrowing pits in the temporary land of Liyang – Guangde Expressway (Anhui section), covering 75.57 ha land (33.68 ha arable land; 7.49 ha garden plot; 32.28 ha woodland; 0.48 ha transportation land; 1.64 ha waters and water conservancy facility land (Table 2). Borrowing pits damage the land in the form of excavation, and the damage results include the ground elevation reduction and serious potholes[4].

By design, the average digging depth of borrowing pits is 3.3 m. The borrowing pits cause a great damage to the land, so the reclamation is difficult.

The borrowing pits are generally in the hilly areas, surrounded by the arable land, and the major factor limiting reclamation is land source[5]. Thus, the land reclamation mode of "crushed stone backfilling + deep digging and shallow filling" is adopted, that is, for the place with relatively high elevation and little earth to be fetched, the construction waste in the construction site or construction road is first backfilled to a certain depth, then the earth fetched from the deeper borrowing pits is used to cover the backfilled construction waste, and finally the pre-protected topsoil is used to cover it, to form a terrace; at the same time, the inside slope protection works should be enhanced. A certain area of water is retained at the bottom. The land after reclamation is used based on its actual conditions.

In addition, if the transportation is convenient in the dumping area, a portion of the soil can be used for the reclamation of borrowing pits according to the actual situation.

2.2.2 The flatbed-type reclamation mode. This mode is suitable for the dumping area. There are 10 dumping areas in the temporary land of Liyang – Guangde Expressway (Anhui section), covering 12.26 ha land (5.37 ha arable land; 0.77 ha garden plot; 5.44 ha woodland; 0.68 ha waters and water conservancy facility land (Table 2).

The dumping area damages the land in the form of occupation, and a large pile of soil and solid waste will damage the vegetation.

According to the project design, the average piling thickness in the dumping area is 6 m. Due to the high elevation and uneven piling height, so the flatbed-type reclamation mode is used, that is, based on the surrounding natural conditions, without destroying other land and ecology, a portion of soil is carried away before reclamation as far as possible, elevation is lowered, and then after using bulldozers to level the land, the pre-protected topsoil is used to cover and level.

This reclamation mode should be fully integrated with the surrounding environment while paying attention to the soil conservation projects.

2.2.3 The land reclamation mode of "combining carrying and burying of construction waste – scarification and earth covering side by side". This mode applied to the construction site and construction road. There are 2 construction sites in the temporary land of Liyang – Guangde Expressway (Anhui section), covering 7.87 ha land (3.83 ha arable land; 2.66 ha woodland; 0.04 ha transportation land; 1.34 ha waters and water conservancy facility

land; 22.53 ha construction road land (Table 2).

The construction site and construction road damage the land in the form of compaction and occupation[6]. Before the use, the temporary land is compacted and hardened, and covered with a layer of cement or concrete, completely destroying the agricultural production function of land.

So, the land reclamation mode of "combining carrying and burying of construction waste – scarification and earth covering side by side" is adopted, that is, the hardened layer is removed and broken prior to the reclamation, and carried away as far as possible for other purposes, such as reclamation of borrowing pits, and the remaining part is in situ buried; after the treatment of construction waste, scarification work is carried out to create the physical structure of the soil; finally, the pre-protected topsoil is used to cover it in order to restore the agricultural production function of land.

Table 2 The land use structure adjustment of Liyang – Guangde Expressway (Anhui section) before and after the reclamation Unit: ha

Land type	Borrowing pits		Dumping area		Construction site		Construction road		Total		
	Before damage	After reclamation	Before damage	After reclamation	Before damage	After reclamation	Before damage	After reclamation	Before damage	After reclamation	Change
Arable land	33.675 6	24.867 3	5.367 8	4.984 1	3.830 9	3.345 5	22.5253	22.525 3	65.399 6	55.722 2	-9.677 4
Garden plot	7.489 6	5.194 3	0.765 5	0.458 2	0	0	0	0	8.2548	5.652 5	-2.602 3
Woodland	32.283 8	30.034 3	5.447 1	4.420 4	2.663 9	3.689 6	0	0	40.394 8	38.144 3	-2.250 5
Transportation land	0.478 3	0.478 3	0	0	0.04	0.04	0	0	0.5183	0.518 3	0
Waters and water conservancy facility land	1.638 7	14.991 5	0.676 2	2.393 9	1.337 2	0.796 9	0	0	3.652 1	18.182 3	14.530 2
Total	75.565 7	75.565 7	12.256 6	12.256 6	7.872	7.872	22.525 3	22.525 3	118.219 6	118.219 6	0

3 Conclusions

The expressway temporary land reclamation is a systematic project integrating engineering measures, biological measures, agricultural measures and technical measures, and needs the theoretical support[7]. The expressway is a line type project, and there are great differences in the natural and social conditions of regions that the expressway runs through.

Even for the same type of temporary land, the extent of damage is different, and the direction of its reclamation is also different due to the different natural and social environment. Therefore, the study of expressway temporary land reclamation mode is of important practical significance to guiding the expressway planning and design, in order to reduce the occupation of arable land, mitigate the extent of damage to the temporary land, and promote the land productivity and ecological function.

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industries and emerging industries, and strengthen the construction of high-tech industrial development zone in Xinjiang, in order to achieve leapfrog development.

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