The **Sustainable Urban Design and Underground Networks in TOKYO, MADRID AND BILBAO**

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ABSTRACT

A case study on the efficiency of the underground networks related to the urban development in Tokyo , Madrid and Bilbao. Part 1 is a case study in Tokyo on the relation between the underground networks and the ground level landscape in the urban redevelopment. Part 2 and 3 are an analysis of other cities in Spain, Madrid and Bilbao.This paper intends to clarify the efficiency of the underground networks to redevelop the center of the cities.

1. INTRODUCTION

Today's most important concept of Urban redevelopment is Sustainability, Multipurpose and Beautiful environment in the urban space. Our objective is to realize the concept utilizing a limited urban space as effective as possible, especially using the underground space as same as surface and sky space.
The case study of Tokyo Marunouchi is focused on the redevelopment in business centre by underground pedestrian networks. The crucial point of Madrid case is a riverside environment with road system and in Bilbao an innovation program of the city against the collapse of main industry is carried forward by reconstructing railways and station into underground space.

2. THE CASE STUDY OF TOKYO STATION UNDERGROUND PLAZA IN MARUNOUCHI AREA IN JAPAN

2.1 The situation of Marunouchi

In Marunouchi many new buildings are under construction in accordance with the urban development rules. Marunouchi area is not only the principal business zone in Japan but also the most important and historical landscape area located in the center of the capital, next to the imperial area.
There are underground networks in the center of Tokyo. Especially in front of Tokyo Station there is an underground plaza as the node of the network connecting neighbor business area Ootemachi and Yurakuchou. This study shows the process of the planning of the networks and the efficiency for the urban redevelopment.

2, 2 The underground network

The first office building in this area was constructed in 1894 and Tokyo station was built in 1914.
Since then a lot of office buildings have constructed together with a subway system.
Underground networks for pedestrian have been also expanded in order to connect buildings with subway stations. Several under pass ways are provided below the plaza, but it is not enough to keep up with the increasing passengers to million and also it was necessary to reconstruct the environment suitable for the entrance of Tokyo.

2.3 The design concept of the center zone of Marunouchi

The center zone is composed of three factors. The first is Tokyo station and the plaza, the second is the imperial area.The third factor is the imperial road located between Tokyo station and Imperial zone. The Tokyo station is not only the center of Japan railway network but also the heart of Marunouchi business area. Millions of businessmen and passengers use this station every day and there are heavy traffic and bus stops in the station square. The landscape of the Tokyo station and plaza is the most important, famous and impressional vista in Tokyo. A recently assigned ambassador rides in a carriage with horses from the station to the Imperial Palace for the inauguration ceremony.
The design concept of the plaza consists of an underground level, ground level and skyline level.

2,4 The project of the underground plaza

Normally the public sector such as Tokyo Metropolitan Government and Chiyoda-Ward is in charge of the matter, but in case of Marunouchi, an organization composed by public sector and private companies cooperated for the redevelopment of the area. A guideline for the city planning was designed by this organization and the plaza was constructed in accordance with it. The lifeline, such as electric and water pipelines, was an obstacle to construct underground network, but a new technology and the efforts of the people led the project to a great success. The study of this project was started from 1997 and the first part of this plaza was concluded 2002.

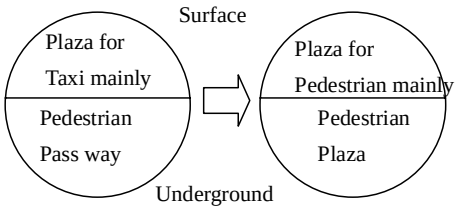

Fig. 2.1. Use of the space

Fig. 2.2 Underground networks

Fig. 2.3. Area of Marnouchi

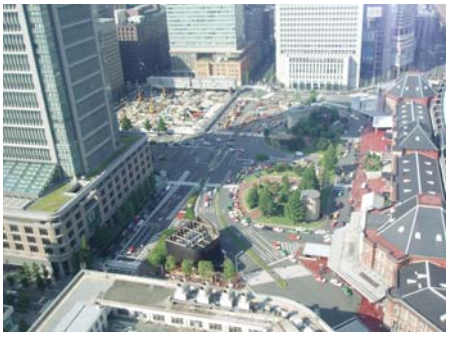

Fig. 2.4. Plaza in front of Tokyo

Fig. 2.5. Plan of Underground plaza

Fig. 2.6. The situation of construction

Fig. 2.7. Underground plaza

2,5 The efficiency of the underground plaza

The efficiency of the plaza is the multiple uses for people including passage use.
1) Passage facility
2) Symbolic landscape of the ground level
3) The waiting space for foreign tourists
4) The fugitive space for people in disaster
5) The connection of underground and ground level

3. THE CASE STUDY OF MADRID M-30 AND THE RIVER MANZANARES

3.1 The situation of Madrid

In Madrid there is so called M-30 highway loop surrounding the center of Madrid, the capital of Spain and the main highways to the other districts link to M-30 by various junctions. The traffic system has been redeveloped during 2004-2007 to settle the traffic jam, heavy noise and air pollution caused by a huge volume of transportation. The plan includes a reconstruction of the road system from ground level to underground level and the activation of riverbank of Manzanares, whose parks on the ground level are still under construction.

3.2 Project of M-30

The main purpose of the project M-30 is to research the problem and reorganize the system.
The project is composed of the reconstruction of interchanges, riverside roads, inner-city roads and bypass system for smooth circulation. Especially the reorganization of riverside space is useful not only for the underground network but also for the activation of ground level with parks and green belt.
The Manzanares was lined with roadways on both sides and it stood in the way of effective use of riverside space. Calle 30 removed the roadways to the underground and the both banks of Manzanares changed to parks and public open space for residents, who can enjoy walking and jogging.

3.3Constraction system

The main organization for this project is Calle 30, which performs key role for planning and reconstruction of M30. Calle 30 receives investment money form both public sector and private construction firm. It is so called public and private partnership.

Fig. 3.1. Madrid M-30 from MDRID M-30 (Madrid: Turner, 2007)

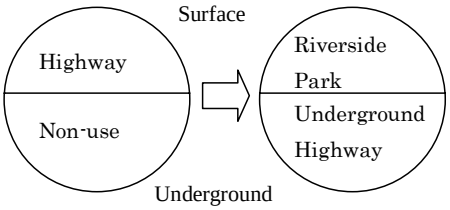

Fig. 3.2. Use of the space

Fig. 3.3. Plan of the riverside park from MDRID M-30(Madrid:Turner,2007)

Fig. 3.4. Section of the riverside park from MDRID M-30 (Madrid: Turner, 2007)

Fig. 3.5. The situation of the river

3.5 Efficiency

1) Increase the capacity of M-30.
2) Recovery of the environmental area surrounding the old section of M30.
3) Regeneration and cleanup of Manzanares River
4) Improvement of the radial connections with surrounding secondary roads.

4. THE CASE STUDY OF AMETZOLA STATION AREA IN BILBAO

4.1 The situation of Bilbao

Bilbao is a main city of the Basque Provinces in Spain. Located in the northern part of the Peninsula, Bilbao has a second biggest international seaport in Spain.
Twenty years ago, Bilbao was completely abandoned because the steel and shipbuilding industry were steadily declining. In order to reshape and reactivate the city of Bilbao, the Basque Country (autonomous community) took the leadership and planned various projects.Those are Abandoibarra project, Ametzola project, reform of traffic system, construction of parkings, including outskirts of the town. They intended to cover not only some area but also the entire city by the projects.

4.2 The project of Ametzola

The Ametzola station is located at the southern part of Bilbao. This area was suffering from the gap of uneven land, separated by the railways.
A public organization Ría 2000 realized a large-scale project during 1994-2007 to cover over the railways and to develop a level ground for parks, housing lots and roads.
Amezola project is the most important project for Ría 2000 based on the area redevelopment strategy.

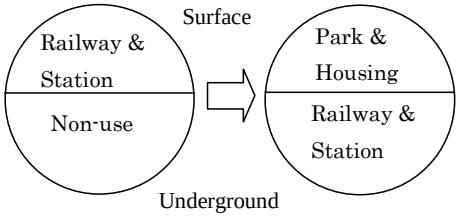

Fig. 4.1 Use of the space

Fig. 4.2 The centre of Bilbao

Fig. 4.3 Project of Ametzola from Bilbao Ría 2000(Bilbao:Bilbao Ría 2000,2007)

1) Combine two areas.
2) Change the railway space to parks
3) Cover over the railway space and use the space to roads.
4) Housing project.

4.3 Organization

Two main organizations lead the city redevelopment; Ría 2000, a public organization for city planning with infrastructures, buildings and long-range program and Metropoli 30, a joint venture with the public and private sector to make concepts of the projects.
In addition to them, private companies invest in other projects such as Guggenheim Museum.

4,3Efficiency

1) Good and clean environment and landscape for people
2) City life in a natural environment, parks and pedestrian deck
3) Houses in front of the station
4) Symbolic project from a heavy industrial city to business city with high-tech industry

5. CONSIDERATION The principle for sustainable city

5.1. Sustainable city

To change an old urban system to a new one is a pressing need to deal with internationalization, diminution of population, global environment problem. It is possible to evolve the function, environment and landscape of the city by using underground space and ground level efficiently.

5.2 The public and private partnership

To guide every project to success, a joint venture or a close partnership between public and private sector is a prerequisite. So it is necessary to have the future vision of the city.

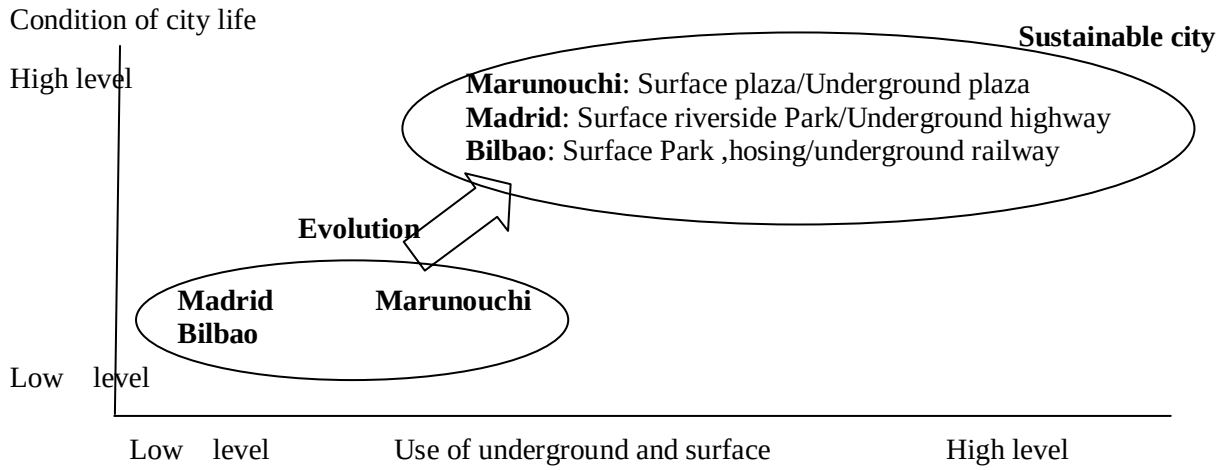

Fig.5.1 The efficiency of three projects

6. CONCLUSION

In this paper we studied on three undergoing projects in Tokyo-Marunouchi, Madrid and Bilbao in Spain.
The common component is an effective utilization of underground space to maintain the natural environment, history and the present circumstances on the ground level.
The development of underground will open a new way to improve the landscape, the city life and new business with high-tech industry.
A further study of how underground space is useful for urban redevelopment and the present tendency of development in other big cities should be conducted.

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