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Exploration and utilization of urban underground space

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Abstract: related research shows that , Worldwide Billion of the population , more than half of the population live in cities , and the number continues to grow . herebackground , City space is heavily compressed , New ways to expand urban space , This makes urban underground space development more and more attention . through city underground space development , build three-dimensional city , Promote urban land intensification use , and effectively expands the city's capacity , to achieve sustainable urban development . based on this , This article about City Comprehensive analysis of space development and utilization under , and raise a point of view , For reference .

Keywords: City Building ; Underground Space ; Development

1. Overview of urban underground space

land space can be divided into surfaces , On the ground , Three-layer underground . from human society Fair view , Human land surface development has been very mature , even can say Human civilization is based on the development of land surface of the . however , with population Long and urbanized construction continues , Urban land resources are becoming more and more expensive , City space is also gradually compressed , Pure Land surface development has apparently been unable meet city development Requirements [1] . so , human Eyes on the underground space , Expand City Capacity by developing underground space , providing a foundation for urban sustainable development . from an objective point of view, City Underground space belongs to natural space category , Previous due to geological conditions , economic conditions and related technology restrictions , City Underground space should be value not fully mined . now , with City economy and related technology water flat elevation , the potential for urban underground space will gradually be released , and make An important foundation for future urban Development . of course , City Underground space with other since is like a resource , and is also limited . to make full use of urban underground space , must do Good planning work , through resource consolidation , Resource Configuration optimization , let City underground space Development Performance .

2. Analysis of principles related to urban underground space development

In the urban underground space development process , should follow hierarchical vertical development of the original then . current , Development depth of underground space primary stay to shallow level (0 to -30m inside), But in future urban development , Mid-level (-30m to -100m) even deep (Super -100 m) Underground space will become the development object [2]. so , in development design procedure , should make a forward-looking plan , Guided by a

constrained design concept , tovertical space for reasonable layering , and set related standards , to lay the groundwork for . to make The hierarchical planning take full account of the properties of public facilities and related functional requirements , to place to make a reasonable division of functional areas . For example , Shallow underground space can be short for residents period active space , apply to shopping , public Activity ; Deep Space is used for storage , Logistics or waste disposal . in City underground pipelines , Line planning process , should It is laid on the top floor of the underground space , Avoid shallow underground space or deep underground Space Development brings thousands of disturbances . at the same time , resident activity space should be near the surface , to facilitate People's Access , Even if there are accidents, can evacuate people quickly . . In addition , Filter the appropriate flat space aggregation type based on the actual environment , to meet overall Regional Development Requirements , and to Some extent increase the overall utilization of the underground space .

3. Analysis of factors affecting urban underground space development

Urban Underground space development process , can be limited by a number of factors , main behaves as follows :

3.1 Economic factors

compared to ground engineering , same project with underground space Development input amount is at least the ground project investment 3times above , even up to 8 to Ten times [3]. in other words , Urban underground space development requires absolute economic strength as security . related research shows, underground space development with per capita GDP has a secret cut Contact , detailed following figure 1 shows.

The can be seen from the previous illustration in comparison with foreign countries , Domestic Urban underground space Development also has a specific phenomenon .First-line Metropolitan per person GDP more than Dollar food , Underground Space development can enter the comprehensive utilization stage ; however , two , three cities when per person GDP over 3000 USD , before entering the underground space development phase , this The is mainly because two , three- tier cities are relatively small, resulting in . summary , City underground Space development requires a lot of investment capital as support , to City overall economic level has higher requirements [4].

3.2 size factor

The overall economy of the city and the city scale also exist close together Department . in the process of increasing total urban economy , City agglomeration force also continues promote , its size will gradually expand . When a city expands to a certain extent , The growth rate of its size will stagnate . and under convergent benefits trend , All industries gathers in the city center , causes local area population density to rise , to local Space capacity brings great pressure . followed by traffic congestion , base facilities Add up , This is clearly inconsistent with the concept of sustainable development . current , very Multiple cities are divided as Old City andNew Town . compared to, old urban population pressure is greater than the newer urban area , space capacity smaller . to promote the old urban space capacity , Will inevitably carry out urban reconstruction . in this procedure , Many historical neighborhoods or even heritage buildings are victims. , cause a massive loss of cultural heritage in the city . however , The development of urban underground space is an effective way to alleviate the above contradictions. , to population bypass to an important effect .

3.3 City Extensions

City is always in a state of development , Its capacity also expands . when the city develops to a certain extent , Its agglomeration effect will become more obvious show , make space original , related facilities cannot meet population growth , guide to increase the living costs of residents , City operating efficiency lower ,Land Resource Premium . city [] The development of underground space will be stimulated to some extent by agglomeration effect , and become key ways to expand urban capacity , to ease resource inconsistencies .

4. analysis of urban underground space development and

Countermeasures

4.1 Policy Support

high cost of underground space development , Invests in a larger , causes many investors not to is willing to participate in . current , Development and utilization of urban underground space is still in its infancy , The entire system is not mature . so , Government and relevant administration should be issued a corresponding macro Policy, Guide investors into underground space development projects . Special
is part of the first tier city , such as Shanghai , Beijing etc , can be piloted , to mitigate the table surface Space development pressure . through preferential policies such as tax breaks , attracting investors to participate in its in , Promote comprehensive benefit of city .

4.2 speeding up the construction of underground municipal facilities

to build municipal facilities in underground space , to prioritize construction stress , and to Environmental effects . For example , Building underground substations to allow substation construction breakthrough domain restrictions , give full play to commercial value of land . underground substation HV equipment Insulation ok , safe distance is shorter , covers less area , No greening works , have The effect resolves the contradiction between the substation and the city ring . to place the substation in the underground, drastically reduces radiation , noise , effectively lowers the lives of the people. effect .

4.3 Perfect the layout of the underground space

During the underground space planning process , should always be guided by the development of urban form forward , ensure underground space layout and city form coordination , Consistent . where the uniaxial cloth Bureau can be used in a ribbon layout City , facilitates early development of underground space . but development near saturation will hinder subsequent development . Many urban scale extensions are in concentric or multiple axes . so , Underground Space development construction should be more axis ring main , This pattern is compatible with urban development features , No to the ground face environmental impact , also creates resilient space for City follow-up [5] . simultaneous , Underground space Exploitation and utilization , the should be based on ground space functionality . from an objective point of view, urban space is closely related to underground space , exist each other
affects , restricted relationships . through overall optimization , Let the two close together , co-issued swing function , To avoid disjointed .

5. Epilogue

A comprehensive view of , Urban Underground space development and utilization is the realization of urban modernization Inevitable Way , easing contradictions in the city's traditional development model , for City with to new vigor . of course , Development and utilization of underground space needs to be balanced from multiple anglesamount , through comprehensive tradeoff , ensure the rationality of underground space planning . on the other hand , The development of urban underground space can not be separated from the Government's relevant policy support , in policy-oriented to attract more investors to participate in it, promoting urban underground space development .

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