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Development Bureau
Technical Circular (Works) No. 9/2020
Blue-Green Drainage Infrastructure

Scope

This Circular sets out the policy for wider adoption of blue-green drainage infrastructure elements (Blue-Green Elements) in the design of drainage measures for all government projects with a view to enhancing the adaptive capacity of the drainage system and other associated beneficial uses. Director of Environmental Protection, Director of Housing, Director of Home Affairs and Director of Agriculture, Fisheries and Conservation have agreed to the contents of this Circular.

Effective Date

2. This Circular takes immediate effect.

Effect on Existing Circulars

3. This Circular should be read in conjunction with the Environment, Transport and Works Bureau Technical Circular (Works) No. 2/2006 “Drainage Impact Assessment Process for Public Sector Projects” (ETWB TC(W) 2/2006).

Background

4. During rainy season, Hong Kong is from time to time threatened by inclement weather such as prolonged heavy rains and typhoons. The average annual rainfall is about 2 400 millimetres (mm), making Hong Kong one of the highest rainfall cities in the Pacific Rim. The Drainage Services Department (DSD) has been striving to prevent flooding by adopting a three-pronged approach (viz. stormwater interception at upstream, flood storage at mid-stream and drainage improvement at downstream) which is proven effective in mitigating the impact of rainstorm and flooding hazards. The number of flooding blackspots has been reduced significantly in the past decades.

5. In recent years, global climate change leads to sea level rise as well as more frequent occurrence of extreme rainstorm and storm surge events, posing new challenges to flood risk management. To combat climate change, the Government has issued the “Hong Kong’s Climate Action Plan 2030+” in January 2017 and DSD has been actively promoting the “blue-green drainage infrastructure” concept with a view to enhancing the flood adaptive capacity of the city’s drainage system against uncertainties associated with climate change, among others.

Blue-Green Drainage Infrastructure

6. The blue-green drainage infrastructure resembles other similar concepts, such as the “Sponge City”, the “Active, Beautiful, Clean Waters”, the “Sustainable Drainage System” and the “Low Impact Development” being adopted in the Mainland, Singapore, the United Kingdom and the United States respectively. By making a city functions like a sponge, the blue-green drainage infrastructure enhances the city’s flood adaptive capacity through promoting infiltration, storage, purification, reuse and discharge. Further, the attenuation of the peak flow and reduction of surface runoff entering into the drainage system can improve the tolerability of the drainage system under extreme rainfall scenarios.

7. In addition to flood prevention, blue-green drainage infrastructure can help develop and take forward the concept of “Rivers in the City”, as stated in the 2019 Policy Address, through river revitalisation projects and introduction of water bodies rejuvenation facilities. The initiative not only allows the public to enjoy river channel facilities, experience the multiple values of water bodies, and treasure water bodies, but also enhances

biodiversity¹ and create a better living environment.

8. Blue-Green Elements generally include the following -

- i. **Revitalised river channel**² – It provides other multiple functions including greening, beautification, biodiversity conservation and water friendliness, in addition to drainage improvement.
- ii. **Flood lake/wetland** – It provides the functions of retention, attenuation and/or treatment of surface runoff. The aquatic vegetation along their shoreline, shallow zone, or artificial floating island provide benefits of stormwater purification, biodiversity conservation and amenity for public enjoyment.
- iii. **Flood storage tank** – It uses underground space for temporary storage of surface runoff before controlled discharge or reuse of the stormwater for irrigation or other non-portable purposes. The space above can be for recreation or other uses, while the space inside could also be explored for suitable uses during dry season.
- iv. **Floodable area** – A multi-functional area (such as recreational ground in normal day) can serve as a drainage facility for temporary storage of floodwater in extreme rainfall event without causing major impact to the area.
- v. **Bioretention system (rain garden and bioswale**³) – It consists of shallow landscaped depressions that allow runoff to infiltrate through the surface, and purify the stormwater through the use of engineered soils/medium and vegetation (biofiltration).
- vi. **Green roof** – Its vegetated surface provides a degree of retention and attenuation, and promote evapotranspiration.

¹ The Hong Kong Biodiversity Strategy and Action Plan (2016-2021) encourages the adoption of blue-green infrastructure with a view to enhancing the biodiversity in our urban environment.

² It includes nullahs, engineered channels, rivers, etc.

³ With the porous paving system and bioswale being implemented on a trial basis, conventional road drainage system should be provided together with the porous paving system and bioswale during the trial. Details and scope of the application of porous paving system and bioswale will be further reviewed, after taking into consideration of the result of the trial.

The vegetation also lowers indoor temperature, reduces building energy consumption and may enhance local biodiversity.

- vii. **Porous paving system**³— It allows runoff to infiltrate through the surface and into the underlying layers, and temporarily stored beneath the pavement and infiltrate into the ground.
- viii. **Water harvesting**⁴ – Water resource is stored locally for reuse in order to reduce the surface runoff.

Policy

9. For government projects which are required to conduct drainage impact assessment (DIA) under ETWB TC(W) 2/2006, the project proponent⁵ should actively consider the incorporation of Blue-Green Elements and apply the principle of “single site, multiple uses” in DIA and project design for enhancing the adaptive capacity of the drainage system and other associated beneficial uses.

10. The project proponent should seek advice from DSD on possible Blue-Green Elements to be included in the project. Where considered necessary, DSD can recommend the project proponent to adopt particular Blue-Green Element(s). In addition, Blue-Green Elements with multi-functions may involve unconventional maintenance and operation issues⁶ to be agreed/resolved by relevant departments. To address the respective financial and programme implication, the project proponent should commence the planning of Blue-Green Elements at the early stage of the project as far as

⁴ The project proponent could make reference to the “Technical Specifications on Grey Water Reuse and Rainwater Harvesting” issued by the Water Supplies Department for the standard of water harvesting.

⁵ As defined in ETWB TC(W) 2/2006, the project proponent is the department, agency or body, directly responsible for the project development at different stages of activities such as feasibility study, design and implementation. The relevant works agent of the project should inform his client department and if necessary, seek technical advice from DSD regarding the scheme for implementation of blue-green drainage infrastructure.

⁶ For example, a floodable area serves both recreational and drainage functions. The project proponent may determine the management and maintenance agent of the blue-green element(s) based on its primary function, e.g. the floodable area primarily serves as recreational area, but occasionally provides temporary storage of surface runoff under heavy rainfall. The operator of the recreational area (primary function) might be the management and maintenance agent.

possible, and allow sufficient time to sort out the maintenance and operation issues with relevant departments. Should there be different views relating to the implementation of Blue-Green Elements, all parties should make an effort to settle the disagreement collaboratively. If agreement cannot be reached, the project proponent should notify DEVB and relevant Policy Bureau, as appropriate, for resolution.

11. In designing Blue-Green Elements, reference should be made to DSD's prevailing guideline(s)/practice note(s), including Stormwater Drainage Manual and DSD Practice Note No. 1/2015 – Guidelines on Environmental and Ecological Considerations for River Channel Design.

12. Being the leading department in promoting the use of Blue-Green Elements in drainage-related works projects, DSD should timely review and prepare relevant guidelines as well as engage the public, consultants and working partners in the course of the review⁷.

Enquiries

13. Enquiries on this Circular should be addressed to Chief Assistant Secretary (Works) 5. Technical enquiries on Blue-Green Elements should be addressed to Chief Engineer/Land Drainage of DSD.

(LAM Sai-hung)
Permanent Secretary for Development (Works)

⁷ The review should include, inter alia, an evaluation of the performance and effectiveness of the Blue-Green Elements.