

香港特別行政區政府
The Government of the Hong Kong Special Administrative Region

政府總部
發展局
工務科



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Group : 12

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Development Bureau
Technical Circular (Works) No. 2/2024

Rock Cavern Development

Scope

This Circular promulgates the policy and associated measures for cavern development in Hong Kong and apply to all government projects¹. It also sets out the membership composition and updates the terms of reference of the Sub-Committee on Cavern Development (SCCD)² established under the Committee on Planning and Land Development (CPLD).

Effective Date

2. This Circular takes immediate effect.

Effect on Existing Circulars

3. This Circular supersedes Development Bureau Technical Circular (Works) No. 8/2017, which is hereby cancelled.

¹ For the purpose of this Technical Circular, government projects shall mean capital works projects or studies in or planned for inclusion in the Public Works Programme.

² The membership and terms of reference were originally set out in Development Bureau Technical Circular (Works) No. 8/2017 which are superseded by this Circular.

Background

4. Creating new land is essential to the sustainable development of Hong Kong and cavern development is one of the viable options under the multi-pronged strategy³ to increase land supply. In Hong Kong, the hilly terrain with strong rocks is highly suitable for developing rock caverns, particularly on the urban fringe. There is proven local experience in cavern development as demonstrated by various existing facilities built in the territory⁴.

5. To gradually unleash the potential of cavern development, the Government has completed a study on the long-term strategy for cavern development, formulated a policy and put forward suitable measures to facilitate the use of rock caverns.

6. In light of this, the Government has prepared a territory-wide Cavern Master Plan (CMP) (A brief description is in **Appendix A**) to facilitate the due application of cavern development in Hong Kong since end 2017. The CMP delineates Strategic Cavern Areas (SCVAs) that are well placed for cavern development and provides general guidelines on project planning and implementation, which could enable project proponents to identify suitable cavern sites for development as and when needed. To avoid jeopardising these valuable land resources, a vetting mechanism has been established to safeguard the development potential of SCVAs and optimise their utilisation.

Policy

7. With the experience gained from implementation of cavern development projects over the years, the approach in using caverns for accommodating/relocating government facilities has been reviewed and optimised.

8. While the Development Bureau (DEVB) is responsible for overseeing and implementing the policy for cavern development, project proponents of government projects (or their works agents in case the project proponents are not works departments) shall abide by the following measures during project delivery to accomplish specific tasks related to cavern development.

³ The Government adopts a multi-pronged strategy, namely redevelopment, review of existing land uses, land resumption, reclamation, rock cavern development and reuse of ex-quarry sites, to increase land supply in the short, medium and long term, through the continued and systematic implementation of a series of measures, including the optimal use of developed land as far as practicable and identification of new land for development.

⁴ Examples of facilities in caverns include Stanley Sewage Treatment Works, Island West Transfer Station, Kau Shat Wan Government Explosives Depot and Western Salt Water Service Reservoirs.

(A) Projects within SCVAs

9. All new government projects and land disposal/alienation proposals (including those for lease modification and land exchange) that wholly or partly fall within SCVAs delineated in the CMP shall be submitted for vetting by the SCCD. The SCCD will make comments and, where appropriate, recommendations on suitable provisions to safeguard the development potential of the SCVAs and optimise their utilisation. Details of the vetting mechanism for projects within SCVAs are contained in paragraphs 15 to 25 of this Circular.

(B) Projects considering Cavern Options for Development

10. When project proponents consider the cavern option as one of the options, they are required to first check if (i) there is a lack of suitable surface site; and (ii) there are specific needs or strong merits to relocate existing government facilities or accommodate new suitable government facilities inside caverns. If the criteria (i) and (ii) are met, the project proponents should proceed to carry out the preliminary option assessments with an aim at comparing cavern and non-cavern options. Details of the vetting mechanism for preliminary option assessments report are contained in paragraph 26 of this Circular.

11. In particular, it might be beneficial to consider the strategic benefits and synergy effect of integrating cavern development opportunities with other surface and subsurface developments at early planning stage, such as under planning and land development studies (e.g. area-based planning and engineering (P&E) studies, or infrastructural development studies) with suitable SCVAs nearby. Such integrated study approach can facilitate holistic consideration of both above-ground and underground land use options so as to optimise the development potential of available land resources.

12. In light of the above, in preparing the study brief for these planning and land development studies, project proponents should explore, in consultation with the GEO if necessary, whether there are suitable SCVAs for utilization. In case there are suitable SCVAs, project proponents should include consideration of cavern development options in the study scope by using the standard clause given in **Appendix B**.

Sub-Committee on Cavern Development

13. The SCCD was established in 2017 and responsible for implementing specific tasks under the policy and advising the CPLD on issues related to cavern development. Its terms of reference are revised below in view of the updates in this Circular:

- (i) to vet the CMP and its revision⁵ thereof, and recommend it to the CPLD for endorsement;
- (ii) to review the priority list⁶ of suitable government facilities for relocating to caverns on need basis when circumstances warrant;
- (iii) to vet Government projects and land disposal/alienation proposals (including those for lease modification and land exchange) that wholly or partly fall within SCVAs shown on the CMP and recommend suitable provisions to optimise the use of SCVAs;
- (iv) to vet and endorse assessments of the recommended cavern option; and
- (v) to consider any other cavern development matters referred by the CPLD.

14. The membership composition of the SCCD is:

Chairman: Deputy Secretary (Works)², DEVB

Members: Representatives (D1 officer or above) from

- Works Branch, DEVB
- Planning and Lands Branch, DEVB
- Geotechnical Engineering Office (GEO) of Civil Engineering and Development Department (CEDD)
- Planning Department (PlanD)
- Lands Department (LandsD)

Secretary: Assistant Secretary (Works Policies), DEVB

Representatives from relevant government bureaux/departments would be invited on a need basis⁷.

⁵ Please refer to paragraph 6 of this Circular. The Civil Engineering and Development Department will review and update the CMP on a need basis, taking into account of changing circumstances and development needs. Revisions of the CMP will be submitted to the SCCD for vetting and the CPLD for endorsement.

⁶ In 2017, several existing government facilities were identified and included in a priority list for relocation to caverns. They were considered to be potentially suitable for early implementation in view of the considerable land gains in meeting the needs of community, or due to the relocation requests from the relevant bureau/departments.

⁷ In handling the submissions, GEO in conjunction with PlanD and LandsD, will provide SCCD with technical support in reviewing the submissions.

Vetting Mechanism for Projects within SCVAs

15. SCVAs are valuable land resources and therefore should be managed in a judicious manner. A vetting mechanism is established to optimise the use of SCVAs by managing cavern and other subsurface developments in SCVAs, without compromising beneficial surface land use and developments. Under the vetting mechanism, all new government projects under the PWP and land disposal/alienation proposals (including those for lease modification and land exchange) that wholly or partly fall within SCVAs shall be submitted at the early planning stage for vetting by the SCCD. Where appropriate, the SCCD will recommend suitable provisions to safeguard the cavern development potential and optimise the utilisation of the SCVAs.

16. The vetting mechanism will be applied in a pragmatic manner and the following general principles will be adopted by the SCCD in the vetting process:

- (i) to optimise the utilisation of SCVAs;
- (ii) to enable beneficial surface and subsurface developments in SCVAs while safeguarding the cavern development potential of SCVAs; and
- (iii) to facilitate integrating cavern development with other surface and subsurface developments in SCVAs to bring about synergy effect whenever possible.

(A) New Government Projects

17. Proponents of new government projects should take note of the CMP in the early planning stage if their development proposals fall wholly or partly within the SCVAs. Possible impact on the cavern development potential of the SCVAs, in particular along those potential portal locations, should also be considered and the layout of the development proposals should be adjusted to avoid the encroachment as far as possible. When such encroachment and/or impact on potential portal locations is/are unavoidable, the development proposals should be submitted for vetting by the SCCD. Project proponents shall consult the SCCD on the need of re-submission if there are any subsequent project changes that may affect the development potential of SCVAs (e.g. major revision of project scope, site boundary, etc.).

(a) Capital Works Projects excluding Category D Items

18. Project proponents are required to make a two-stage submission to the SCCD. The first stage submission shall be made in the early planning stage⁸, using the standard memorandum and checklist in **Appendix C**, to define the project scope and identify potential conflicts with justifications. The SCCD will provide the project proponents with advice on the potential conflicts and, where appropriate, recommendations on suitable provisions that could safeguard the development potential and optimise the use of the SCVAs. The project proponents should review the possibility of minimising or avoiding the conflicts by adjusting the conceptual layout, or incorporating the recommended provisions to enhance the use of the SCVAs, which is still flexible at the early project delivery stage. A summary of the SCCD's advice should be provided in the Technical Feasibility Study (TFS), with a copy of the SCCD's reply attached as an appendix.

19. Unless the SCCD confirms via the first-stage submission that the proposed projects would not affect the integrity of SCVAs, project proponents shall make the second stage submission to the SCCD during the design stage⁹ to elaborate details on how to address SCCD's comments and recommendations. If adverse impacts on the SCVAs are justified to be unavoidable, the project proponents should make suitable provisions in the design scheme to minimise the potential impacts as far as practicable. Project proponents should obtain SCCD's no adverse comment before finalising the scheme. Where appropriate, project proponents may be invited to present the project proposals to the SCCD for consideration.

(b) Capital Works Projects under Category D Items

20. Capital works projects under Category D items typically involve minor works or feasibility studies in respect of new development projects. Project proponents shall make a submission to the SCCD at an early stage (e.g. during preparation of study brief or Category D paper), using the standard memorandum and checklist in **Appendix C**, to define the project scope and identify potential conflicts. Similar to the procedures as outlined in paragraphs 18 and 19, project proponents should obtain SCCD's no adverse comment before finalising the scheme. For feasibility studies, project proponents may consider taking forward the projects by incorporating suitable provisions into the assignment to investigate and address SCCD's comments and recommendations.

⁸ The first stage submission should generally be made in the Technical Feasibility Statement (TFS) stage, or in the Project Definition Statement (PDS) stage in case of study items where the need of TFS may be waived.

⁹ For design and build contract, the second submission to SCCD shall be made at the tender preparation stage or design development stage as considered suitable by the project proponents.

(B) Land Disposal/Alienation Proposals

21. Given that all lands within SCVAs are currently government land, private sector organisations or quasi-government bodies (e.g. MTR Corporation Limited, Housing Authority) would have to acquire land from the Government for development within SCVAs. When land disposal/alienation proposals (including those for lease modification and land exchange) with site boundary that wholly or partly falling within SCVAs and/or having impacts on the potential portal locations of SCVAs are identified by any government departments (e.g. PlanD, LandsD, etc.), the relevant government departments shall consult the GEO on the potential impact of the proposals on the integrity of the SCVAs using the standard memorandum in **Appendix D**. The GEO would also be responsible for screening out those quasi-government development proposals (e.g. railway development projects by the MTR Corporation, housing development projects by the Housing Authority) that wholly or partly fall within SCVAs when the development proposals are submitted to the GEO for geotechnical comments in their early planning stage.

22. Upon receipt of the submission from project proponents, the GEO in conjunction with PlanD and LandsD will assess as appropriate on the potential impact of the proposals on the integrity of the SCVAs and, where necessary, advise for the consideration of the SCCD on the recommended suitable provisions for incorporation in the lease conditions to safeguard the integrity of the SCVAs as appropriate.

23. Land strata within SCVAs that are disposed of for developments will be excised from the CMP. However, developments within the same SCVAs but outside the disposed land strata are still subject to the vetting mechanism of the CMP.

(C) Exemption

24. The following works that are relatively minor in nature with negligible permanent impact on the integrity of SCVAs are exempt from the vetting mechanism:

- (i) routine maintenance and repair works;
- (ii) ground investigation works;
- (iii) slope works;
- (iv) surface/local drainage works;
- (v) planting and landscaping works;
- (vi) paving works;
- (vii) footpaths, access roads and walkway covers;
- (viii) minor works facilities, such as recreational facilities, rain-shelter,

pavilions, street furniture, sitting out areas, gardens, playground and landmarks;

- (ix) small scale improvement/renovation works at existing buildings and facilities; and
- (x) small scale works (e.g. footbridge and piers) with shallow foundation.

(D) Review Mechanism

25. In case the advice of the SCCD is not agreeable to the project proponent of the new government project or land disposal/alienation proposal, the project proponent may request the SCCD for a review. Should there be any irreconcilable disagreement arising from the advice of the SCCD, the project proponent may make submission to the CPLD for deliberation and seek their directive¹⁰.

Vetting Mechanism for Projects Considering Cavern Option for Development

26. When project proponents consider the cavern option as one of the options, they are required to first check if criteria (i) and (ii) in paragraph 10 above are met. If the criteria (i) and (ii) are met¹¹, the project proponents should proceed to carry out the preliminary option assessments including preliminary technical feasibility analysis and life-cycle cost-benefit analysis in terms of both (a) financial viability¹² and (b) intangible benefits. The assessments should aim to compare cavern and non-cavern option(s). The tangible and intangible costs and benefits are listed on the checklist in **Appendix E** for reference. If the cavern option is recommended, the option assessments report should be submitted to the SCCD for vetting and endorsement before the preparation of TFS report. Where necessary, the project proponents may seek technical advice from the GEO on the assessments and any other issues relating to formulation of cavern option for their developments. A flow chart for consideration in adopting cavern option for development and the framework for carrying out the associated preliminary option assessments report are attached in **Appendix F** and **Appendix G** respectively.

¹⁰ The project proponents should be aware of the meeting schedule of the CPLD and allow sufficient time for seeking CPLD's directive.

¹¹ If only criterion (i) or (ii) can be fulfilled and the project proponents still want to proceed with the preliminary option assessments for recommending cavern option, D3 officer's agreement from the project proponents should first be sought.

¹² For relocation of existing government facilities, the financial viability is determined by comparing the estimated land value of the released site and the costs for relocating the facilities including both capital and additional recurrent costs. For provision of new government facilities, life-cycle costs and returns (if applicable) for the option(s) should be determined.

Enquires

27. Enquiries on this Circular should be addressed to the Chief Assistant Secretary (Works)³. For technical advice and assistance on issues relating to cavern development, please contact the Chief Geotechnical Engineer/Geotechnical Projects, GEO, CEDD.

(Ricky C K LAU)
Permanent Secretary for Development (Works)

Cavern Master Plan

1. The Cavern Master Plan (CMP) provides a broad strategic framework to guide and facilitate territory-wide cavern development in Hong Kong, with the following objectives:

- (i) Territory-wide cavern development – to delineate SCVAs that are suitable for developing rock caverns to meet the existing or future development needs;
- (ii) Promulgation of information – to disseminate and publicise information on SCVAs that could enable both government departments and private sector organisations to identify suitable cavern sites for their developments; and
- (iii) Optimal utilisation of SCVAs – to optimise the use of land resources through a pragmatic vetting mechanism for managing cavern and other subsurface developments in SCVAs, without compromising beneficial surface land use and developments.

2. The CMP is a non-statutory plan serving as user guidelines for cavern development, and does not exempt cavern development, no matter within or outside SCVAs, from any relevant statutory requirements. It consists of a territory-wide plan showing the location and boundary of all the SCVAs, an Explanatory Statement (ES) and, for each SCVA, a set of Information Notes (IN). The ES provides the key information on the CMP. It sets out the objectives of the CMP, outlines the rationale and methodology of delineating SCVAs, and highlights key issues for project implementation. A list of land uses with potential for development in rock caverns is also appended to the ES.

3. For each SCVA, an IN is provided to describe the characteristics, district context as well as constraints of the area. This includes details of the geological, environmental and traffic characteristics and other key issues/constraints on cavern development. It also outlines the extent of potential portal locations. A reference drawing is appended to each IN to illustrate the spatial context of the information provided. The CMP is available on the website of the CEDD (<http://www.cedd.gov.hk>). The CMP will be reviewed and updated as necessary taking account of changing circumstances and development needs.

4. The CMP enables and facilitates project proponents to search suitable SCVA for potential cavern development. In conducting planning and land development studies for sites with SCVAs nearby, project proponents should consider the strategic benefits and synergy effect of integrating cavern development opportunities with other surface and subsurface developments at early planning stage.

**Standard Clause to be Included into the Scope of
Planning and Land Development Studies**

In preparing the study brief of the planning and land development studies, project proponents should explore, in consultation with the GEO if necessary, whether there are suitable SCVAs for utilization. In case there are suitable SCVAs nearby, project proponents should include consideration of cavern development option in the study scope by using the standard clause below:

When the Consultants consider the cavern option as one of the options, they are required to first check if (i) there is a lack of suitable surface site, and (ii) there are specific needs or strong merits to relocate or accommodate suitable government facilities inside caverns. If the criteria (i) and (ii) are met¹, the Consultants should evaluate the cost-effectiveness of the cavern and non-cavern option(s) by carrying out life-cycle cost-benefit analysis in the preliminary option assessments report. If the cavern option is recommended and support from policy bureau is obtained, the preliminary option assessments report should be submitted to the Sub-Committee on Cavern Development of the Committee on Planning and Land Development for vetting and endorsement. The Consultants should make reference to DEVB TC(W) No. 2/2024 for details.

¹ If only criterion (i) or (ii) can be fulfilled and the project proponents still want to proceed with the preliminary option assessments for recommending cavern option, D3 officer's agreement from the project proponents should first be sought.

MEMO

<p><i>From</i> Project Proponent/Works Agent</p> <hr/> <p><i>Ref.</i> _____ <i>in</i> _____</p> <p><i>Tel. No.</i> _____</p> <p><i>Fax No.</i> _____</p> <p><i>Date</i> _____</p>	<p><i>To</i> Secretary of Sub-Committee on Cavern Development</p> <hr/> <p><i>(Attn. : AS(WP), DEVB)</i></p> <p><i>Your Ref.</i> _____ <i>in</i> _____</p> <p><i>Dated</i> _____ <i>Fax No.</i> _____</p> <p><i>Total Pages</i> _____</p>
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Vetting of New Government Projects within Strategic Cavern Areas

Project Title : _____

The site of the subject project wholly / partly falls within Strategic Cavern Area(s) No. ___ - _____ in the Cavern Master Plan. Pursuant to DEVB Technical Circular (Works) No. 2/2024, I attach a copy of the location plan and elevations showing the project site boundary and extent of the works. A summary of the project scope is also attached for your reference.

2. Please advise whether the proposed works will affect the integrity of the above Strategic Cavern Area(s) and any suitable provisions for optimising the use of the Strategic Cavern Area(s) are required.

(Name/Title/Department)

- c.c. Policy Secretary
- Client Department
- CEDD (Attn: CGE/GP, GEO)
- PlanD (Attn: CTP/TS)
- LandsD (Attn: CES/HQ, LAO)

**Checklist for First Stage Submission to
the Sub-Committee on Cavern Development (SCCD)
under the Committee on Planning and Land Development (CPLD)**

This checklist is to facilitate project proponents of new government projects to prepare the first stage submission under paragraphs 17 to 20 of DEVB TC(W) No. 2/2024 to the SCCD. A list of details to be included under the standard memorandum in Appendix C of the Technical Circular is given as follows: -

Project scope

1. A summary of project scope.

Location plans, sections and elevations

2. Location plans containing the following information:
 - (i) boundary of the relevant strategic cavern areas (SCVA(s)) and potential portal location(s) as delineated in the corresponding Reference Drawing(s) of the SCVAs and the CMP¹;
 - (ii) project site boundary and extent of the proposed works;
 - (iii) existing and planned underground structures/caverns/tunnels nearby and/or within the SCVA(s); and
 - (iv) project site boundary, boundary of SCVAs and extent of the proposed works overlaid with Outline Zoning Plan(s), if applicable.
3. Provision of cross section(s), longitudinal profile(s) and elevation(s) at intersected Potential Portal Locations and at locations of underground structures/caverns/tunnels identified in item (2) above, based on available ground investigation information. The cross section(s), longitudinal profile(s) and elevated section(s) should include the following information:
 - (i) existing ground profile according to the latest topographical information;
 - (ii) inferred rock head profile based on available ground investigation information;
 - (iii) extent of the affected SCVA(s); and
 - (iv) their relation with the proposed works.

Identification of potential conflicts

4. Identify potential conflicts (e.g. interface with other planned/committed projects) with the SCVA(s) and discuss possible adjustments that can or cannot be made during the course of the study. If alternatives cannot be made, justify the conflicts are the minimal encroachment to jeopardize the development potential of the affected SCVA(s) and propose provisions to enhance the affected SCVA(s)' future development potential; and

¹ The Reference Drawings of the SCVAs and the CMP can be viewed/downloaded from the CEDD website (<https://www.cedd.gov.hk>).

5. Assessment of the possible constraint(s) that may affect future cavern development potential with reference to (i) remaining areas/portions, and (ii) remaining lengths of Potential Portal Locations for cavern development within the SCVA(s) and propose possible solutions to the constraint(s).

MEMO

<i>From</i> _____	Bureaux/Departments	<i>To</i> _____	H(GEO), CEDD
<i>Ref.</i> _____	<i>in</i> _____	<i>(Attn. :</i> _____	CGE/GP)
<i>Tel. No.</i> _____		<i>Your Ref.</i> _____	<i>in</i> _____
<i>Fax No.</i> _____		<i>Dated</i> _____	<i>Fax No.</i> _____
<i>Date</i> _____		<i>Total Pages</i> _____	

Vetting of Land Disposal/Alienation Proposal

Site Location : _____

The subject site for land disposal/alienation wholly / partly falls within Strategic Cavern Area(s) No. ___ - _____ in the Cavern Master Plan. Pursuant to DEVB Technical Circular (Works) No. 2/2024, I attach a copy of the location plan showing the site boundary for your reference.

2. Please advise whether the land disposal/alienation proposal will affect the integrity of the above Strategic Cavern Area(s) and any suitable provisions for optimising the use of the Strategic Cavern Area(s) are required.

(Name/Title/Department)

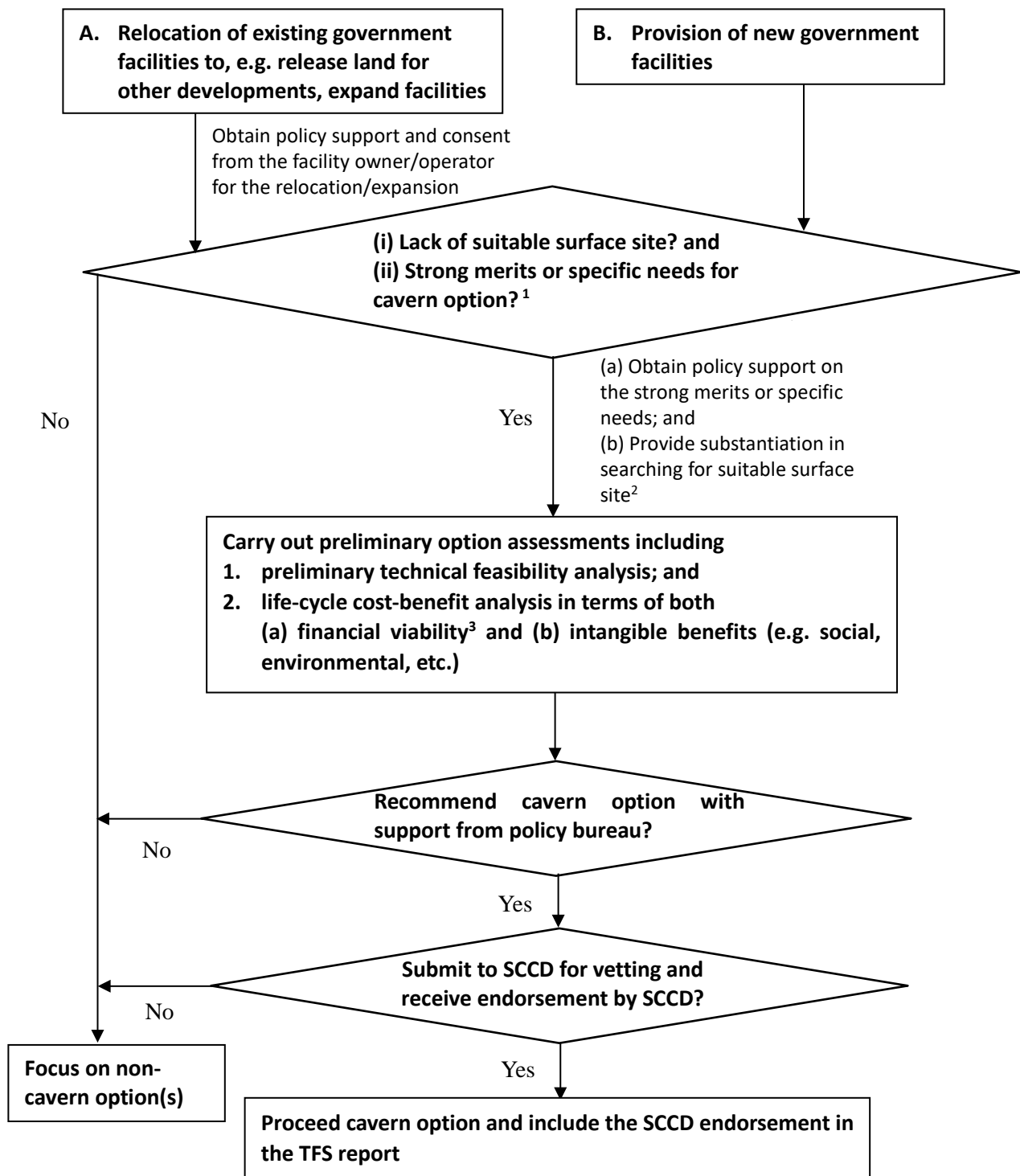
- c.c. Policy Secretary
- LandsD (Attn: CES/HQ, LAO)
- Secretary of Sub-committee on Cavern Development
- (Attn: AS(WP), DEVB)
- PlanD (Attn: CTP/TS)

The checklist below is to facilitate project proponents to consider the tangible and intangible benefits and cost-effectiveness of the cavern option. The checklist is for reference only and not inclusive of all circumstances.

Benefits	Cost/Time Implications
<p><u>Construction</u></p> <ul style="list-style-type: none"> ➤ Less environmental impact or public nuisance during construction in enclosed setting (e.g. less felling of trees, less dust generation, less noise impact) ➤ Values of excavated materials for re-use <p><u>Operation</u></p> <ul style="list-style-type: none"> ➤ Higher energy efficiency for necessary cooling system for specific uses ➤ Enclosed obnoxious facilities (e.g. less visual, air or noise nuisance to adjacent sensitive receivers) ➤ Rock shelter providing highly stable environment in terms of temperature, humidity or vibration, etc. ➤ Highly secured environment ➤ Values of released surface land for other beneficial uses by relocating existing government facilities to caverns or opportunity cost of reducing surface land taken for new facilities ➤ Possible in expanding cavern space for meeting potential future facility expansion requirements ➤ Development potential of adjacent areas released by relocating existing government facilities that are incompatible with the land uses and environment nearby to caverns 	<p><u>Construction</u></p> <ul style="list-style-type: none"> ➤ Additional construction cost for tunnels, cavern complex, ventilation buildings, other ancillary facilities, etc. as compared to other means of land formation ➤ Generally require (i) longer construction period due to the need of substantial rock/soil excavation, (ii) lead-time to carry out permanent access tunnel and construction adits if applicable for cavern site access, possibly lengthening the project programme ➤ Additional burden to reception sites/facilities due to disposal of excavated materials <p><u>Operation</u></p> <ul style="list-style-type: none"> ➤ Additional cost and surface land for operation and maintenance of out-of-cavern facilities (ventilation buildings and/or electricity substations, other ancillary facilities, etc.) ➤ Additional cost for ventilation and fire safety requirements in enclosed setting, e.g. operation and maintenance of smoke extraction system, pressurised protected escape passage, setting down points, etc. ➤ Additional maintenance cost for lining and/or other rock stabilisation works of cavern ➤ Unfit for some special operations (e.g. biological digestion of sludge or co-digestion of sludge and foodwaste) that generate methane gas

Consideration in adopting cavern option for development

When project proponents consider the cavern option as one of the options, they are required to check the following:



¹ If only criterion (i) or (ii) can be fulfilled and the project proponents still want to proceed with the preliminary option assessments for recommending cavern option, D3 officer’s agreement from the project proponents should first be sought.

² e.g. site search in accordance with DEVB GC No. 1/2016, site search under development/consultancy study, etc.

³ For relocation of existing government facilities, the financial viability is determined by comparing the estimated land value of the released site and the costs for relocating the facilities including both capital and additional recurrent costs. For provision of new government facilities, life-cycle costs and returns (if applicable) for the option(s) should be determined.

Framework for the Preliminary Option Assessments Report

1. Introduction
2. Potential Option(s) and Reasons for Considering Cavern Option
3. Preliminary Technical Feasibility Analysis
4. Life-Cycle Cost-Benefit Analysis
 - a. Financial Viability
 - b. Intangible Benefits
5. Recommendation
6. Conclusion