For Discussion
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LEGISLATIVE COUNCIL
PANEL ON ENVIRONMENTAL AFFAIRS

Management of Construction and Demolition Materials

INTRODUCTION

This paper sets out the problems related to the management of construction and demolition (C&D) materials, and the proposed actions to tackle the problems.

BACKGROUND

2. C&D materials are a mixture of inert materials and wastes arising from construction, excavation, renovation, demolition and road works. The useful inert materials comprising rocks, concrete, asphalt, rubbles, bricks, stones and earth are called public fill and are suitable for reuse in public filling areas[1]. Some of them can also be recycled[2] for use in construction works. The C&D wastes comprising bamboo, plastic, timber and packaging waste are often mixed and contaminated. They are therefore not suitable for reuse in reclamation works or recycling as construction materials, and have to be disposed of at landfills. Over 80% of the C&D materials produced locally are inert materials.

3. Between 1991 and 1999, the amount of C&D materials produced annually by local construction activities increased by more than 75% from about 7.7 million tonnes (4.3 million cubic metres) to 13.5 million tonnes (7.5 million cubic metres). In 1999, we had to handle 37,110 tonnes of C&D materials each day. Among them, 79% were inert

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[1] A public filling area is a designated part of a development project that accepts public fill for reclamation purpose. Deposition of public fill in a public filling area requires a licence issued by the Director of Civil Engineering.

[2] Hard materials such as rocks can be recycled as aggregates for concrete / asphalt production or as granular materials for road sub-base and drainage layers etc.

materials reused in public filling areas. The remaining 21% were mixed inert materials and waste which had to be landfilled[3]. The latter made up 44% of the solid waste disposed of at landfills during 1999. Information on C&D materials generation and their disposal between 1991 and 1999 is at Annex A.

Annex A

4. There are three strategic landfills in Hong Kong[4]. They occupy a total of 270 hectares of land[5]. They cost $6 billion to construct and some $400 million each year to operate.

THE PROBLEM

5. C&D materials are voluminous and take up a lot of capacity if they are disposed of at landfills. If current trends continue, all the three landfills will be filled up in 10 to 15 years. We need to divert inert C&D materials away from landfills.

6. However, we are also running out of public filling areas i.e. reclamation projects that take public fill and provide the major outlet for inert C&D materials. All currently approved public filling areas will be exhausted by mid-2002, and scant new capacity has been approved[6]. Without this alternative outlet, it will be extremely difficult to manage the huge volume of C&D materials that construction activities produce everyday.

THE STRATEGY

7. The strategy to manage C&D materials comprises three major

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[3] Based on a survey carried out by the Environmental Protection Department between Sept 1999 and Jan 2000, the mixed inert materials and wastes that were landfilled came from construction of new buildings (57%), renovation of old buildings (21.2%), civil works (11.4%), demolition of old buildings (5.3%) and fitting out of new buildings (5.1%). With proper sorting, the amount landfilled could be reduced to 16%.

[4] They are located at Nim Wan, Tseung Kwan O and Ta Kwu Ling.

[5] This is about two-third the size of Tin Shui Wai.

[6] For further details of the public filling programme, please refer to paragraph 11 below.

tasks – reduce, reuse and recycle. Based on the current composition of our C&D materials[7], the most ideal scenario would be to reuse 59% of them as public fill in reclamation works[8], recycle 25% as aggregates for concrete/asphalt production or as granular materials for road sub-base and drainage layers, and dispose of the C&D wastes in landfills. In working towards this scenario, concerted efforts are required in the following areas -

(a) *Avoiding and minimizing* C&D materials at source through better planning, design and construction management to reduce the overall volume of C&D materials;

(b) *Sorting* C&D materials to prevent inert C&D materials that could be reused or recycled from going to landfills;

(c) Where public filling areas are available, *reusing* inert C&D materials as public fill – this is however becoming increasingly difficult because of the impending acute shortage of public filling areas. This will be elaborated in paragraph 11;

(d) *Recycling* inert C&D materials as aggregates for concrete/asphalt or as granular materials for use in construction; and

(e) *Introducing Landfill Charging* to provide the economic incentive for waste producers to reduce C&D materials that require disposal.

The following paragraphs elaborate on each of the above areas of work –

(a) <u>Avoiding and Minimizing C&D Materials</u>

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[7] Currently, 59% of our C&D materials are excavated soil and slurry. They are not suitable for recycling and can only be used as fill materials in reclamation works or earthworks. Another 25% are rocks, rubbles, concrete, bricks and asphalt, and are suitable for recycling, either as aggregates for concrete/asphalt production or as granular materials for use in road sub-base, drainage layers etc. The remaining 16% are C&D wastes, most of which are mixed and contaminated and are not suitable for reuse or recycling.

[8] Reusing public fill in earthworks, such as site formation works, can also be considered.

8. Reducing the production of waste at source is most crucial. The construction industry is currently exploring alternative construction methods, materials and technologies that reduce C&D materials[9]. In this connection, the Government has been taking the lead. For example, major public works project proponents are required to prepare detailed Waste Management Plans[10]. We also foster adoption of new construction techniques[11] and environmentally-friendly construction practices[12] etc.

(b) Sorting of Mixed C&D Materials

9. Sorting is the separation of inert C&D materials from C&D wastes. This enables reuse and recycling of the former and reduces the amount of waste to be landfilled. The Government has again taken the lead by requiring, where practicable, on-site sorting in Government projects. We are aware that site constraint is a major difficulty for many construction projects. We therefore intend to put in place off-site sorting facilities[13] for the construction industry to sort C&D materials. They will be built and managed to the highest environmental standards to minimize impacts. A reasonable distribution of such facilities around the urban area will reduce the movement of dump trucks in the city, helping contain air pollution and noise impacts. However, locating these facilities has been

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[9] For instance, prefabrication and metal formworks could reduce the use and subsequent disposal of timber. Metal scaffolding could also replace bamboo, while steel could replace high-strength concrete and could result in overall reduction of C&D materials.

[10] Since December 1999, "designated projects" under the Environmental Impact Assessment Ordinance may be required to prepare Waste Management Plans, covering issues like minimization and sorting of C&D materials, and the use of substitutes for timber etc. The Architectural Services Department and the Housing Authority have already made such Plans mandatory in their construction contracts. The feasibility of extending this requirement to all Government projects is being considered.

[11] For instance, the Housing Authority has been using precasted facades, staircases and semi-slabs, as well as prefabricated doorsets, metal gates and cooking benches. It has also adopted metal hoardings and metal formworks to replace timber.

[12] The Buildings Department is reviewing the building regulations and procedures with a view to promoting the construction of environmentally friendly buildings. It has also set up a Building Innovation Unit to encourage and facilitate the wider use of innovative and sustainable construction methods, materials and designs through the granting of incentives.

[13] Currently, there is a temporary sorting facility at Tseung Kwan O. We will commission another temporary one in Tuen Mun in 2001. We also plan to co-locate permanent sorting facilities with public filling barging points at Chai Wan and Kwai Chung. Other possible sites for additional sorting fa cilities are being examined.

difficult because of local objections.

(c) Reusing Inert C&D Materials in Public Filling Areas

10. The Public Filling Programme is important. This is because however effective we are with reduction and sorting, we still need to handle a substantial volume of inert C&D materials that cannot be recycled and should not be landfilled. Public filling areas provide a good avenue for these inert materials[14]. Use of inert C&D materials also reduces the need for marine sand for reclamation, helping reduce the environmental impact from sand dredging.

11. As stated in paragraph 6 above, we are running out of public filling capacity. At present, there are three public filling areas[15]. Annex B shows the available public filling capacity provided by approved reclamation projects. These projects will provide sufficient capacity till mid-2002. Between mid-2002 and the end of 2003, the available capacity will only be able to absorb 20% of the public fill expected. There will be a shortfall in public filling capacity of about 17.4 million tonnes (9.6 million cubic metres) over this period. The situation beyond end-2003 is even more uncertain as no more public filling areas have been approved. Annex C shows the scale of shortfall between the available public filling capacity and the projected volume of C&D materials.

12. While we are trying all possible means to programme and utilize those approved reclamation projects to accommodate inert C&D materials, the impending acute shortfall in public filling capacity is currently the major crisis that requires our priority attention. We do not have any an instant solution in this regard.

13. Another related problem that needs to be addressed is the short-term mismatch between supply and demand for public fill. Such mismatch is extremely wasteful as the scarce public filling capacity

[14] The percentages of using inert C&D material as public fill in reclamation projects vary – from 23% in 1991 to 35% in 1994 and 79% in 1999.

[15] The three public filling areas are at Tung Chung, Tseung Kwan O and Pak Shek Kok.

would be taken up by marine sand, and useful fill materials would have to be landfilled. While the use of public fill as surcharge to accelerate settlement could help stockpile surplus materials temporarily, this can only be done where site conditions permit. For longer-term regulation of the demand and supply, we will need to set up "fill banks". A site search for suitable areas for this purpose is underway.

14. Separately, we are aware that transportation of public fill by trucks to remote public filling areas would create environmental and traffic problems. Conveniently located barging points are thus needed to minimize these truck journeys[16]. We will ensure that these barging points are well-managed with special measures to reduce the environmental nuisance to nearby residents[17]. There will also be off-street vehicle queuing and inspection areas to alleviate the burden on adjoining roads.

(d) Recycling Inert C&D Materials As Construction Materials

15. Aggregates and rock products are critical to construction activities. In 1999, Hong Kong consumed about 14.5 million tonnes of aggregates and rock products, about 50% of which were imported and the others obtained from four local quarries[18]. Recycling of inert C&D materials as aggregates is possible, although some processing work[19] is required. Examples include turning them into aggregates for concrete / asphalt production, or into granular materials for use in road sub-base and drainage layers etc. The necessary measures to take forward this concept are being introduced[20].

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[16] There are currently five temporary barging points at Sai Ying Pun, Quarry Bay, Shatin, Tseung Kwan O and Tuen Mun.

[17] Examples are fully paved compounds, water-sprays for dust and dirt suppression, enclosure of the tipping ramps to contain noise and dust, and perimeter walls to soften the visual impact etc.

[18] The four quarries are at Lam Tei, Shek O, Lamma Island and Anderson Road.

[19] This involves sorting the inert materials from the C&D wastes, crushing the materials into sizes suitable as aggregates, and grading of the aggregates etc.

[20] The specifications for public works projects are being amended to allow the use of recycled aggregates. Performance testing for both low-strength and high-strength concrete will also be conducted. On the supply side, we plan to set up small-scale temporary recycling facilities in Tseung Kwan O and Tuen Mun. We are also planning to establish a large-scale pilot recycling facility at Kai Tak.

(e) Landfill Charging

16. Currently, disposal of waste at landfills is free. There is thus little incentive to reduce the disposal of C&D materials. It is therefore essential to put in place a landfill charging scheme as soon as possible to provide the economic incentive for waste producers, including developers and construction project proponents, to reduce C&D materials and to reuse and recycle as much as possible. Practical arrangements for implementation are now under discussion with the various sections of the industry that will be affected.

LOOKING AHEAD

17. Reducing the production of C&D materials at source will continue to be the key objective. We will continue to promote the concept of sustainable construction and encourage the construction industry to adopt new construction methods, materials and technologies that reduce C&D materials. In addition, making buildings more durable and extending their lives can be achieved through better maintenance, better materials and better designs. All these will help defer the need to demolish old buildings, thereby reducing the amount of C&D materials produced in the long term.

18. The secondary objective is to maximize the recovery of suitable materials for reuse and recycling, and fully separate waste from inert materials to minimize waste disposal demand.

19. However, even with these avoidance and reduction measures, it is projected that there will still be some 8 million tonnes[21] of inert materials produced each year. With the reduction of reclamation for urban purposes, we have to examine other possible options. We will soon commission a study on the long-term arrangements to accommodate inert C&D materials. One such option is to develop “eco-island” for wetland and marine habitat creation, environmental education, and

[21] There could be year to year fluctuations.

possibly for accommodating environment-related facilities such as landfills. The study will, among other things, examine the pros and cons, as well as the overall environmental benefits and impacts of this option.

CONCLUSION

20. The above is a brief account of the issues in managing the huge amount of C&D materials that construction activities generate each day. There is no one solution to the problem. A comprehensive range of management measures need to be applied. These include –

- Encouraging the industry to explore and adopt *alternative construction methods, materials and technologies* to reduce C&D materials at source (para 8);

- Encouraging sorting of inert C&D materials from C&D wastes and put in place *off-site sorting facilities* (para 9);

- Providing *fill banks* to regulate short-term mismatch in demand and supply of public fill (para 13);

- Putting in place a network of *conveniently located barging points* to minimize travel distance of dump trucks (para 14);

- Putting in place *recycling facilities* to facilitate recycling of C&D materials (para 15);

- Encouraging the *use of recycled aggregates and granular materials* (para 15);

- Introducing *landfill charging* (para 16);

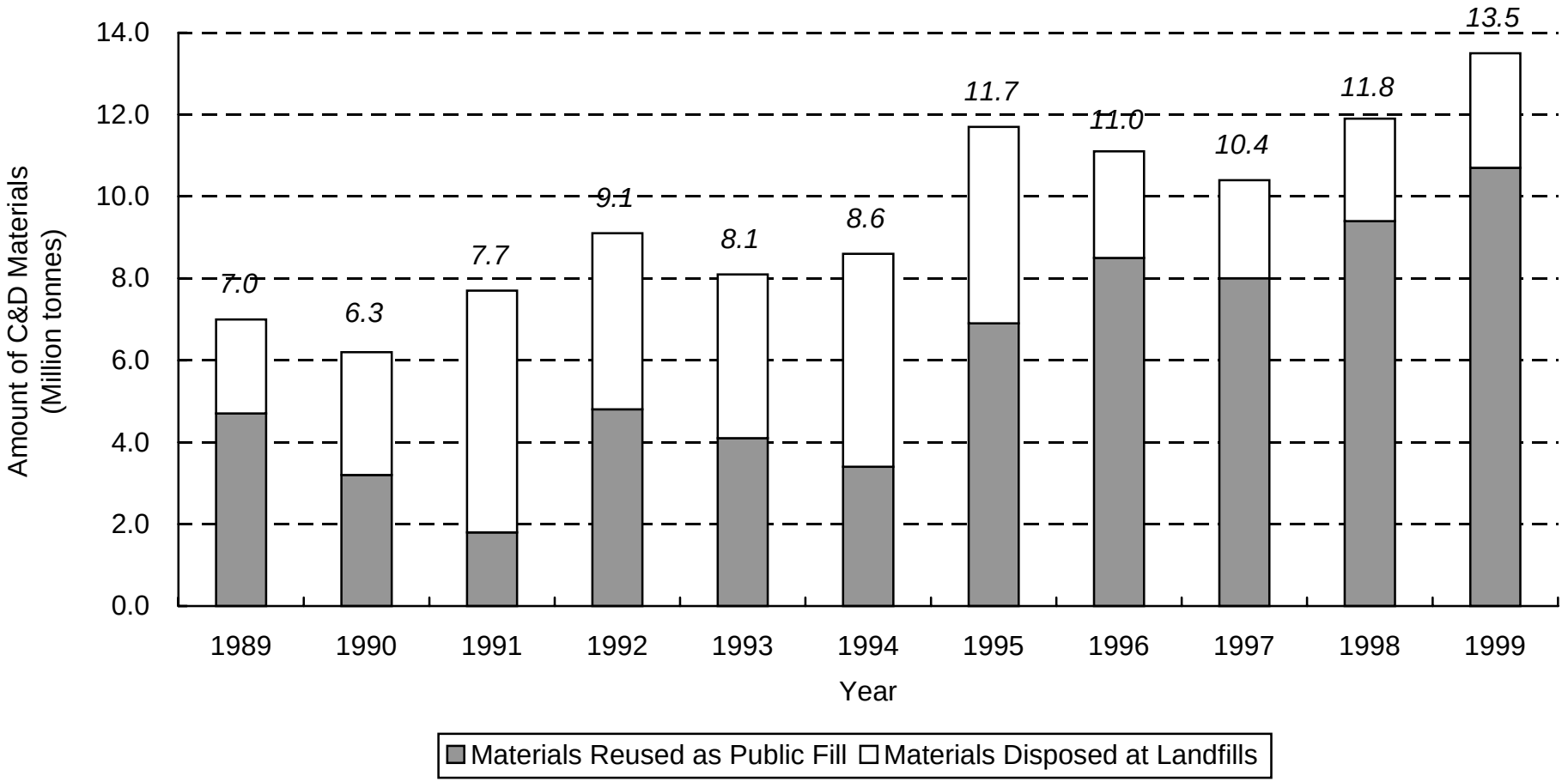
- Promoting the concept of *sustainable construction* (para 17); and

- Planning ahead for the *long-term accommodation of inert C&D materials* (para 19).

21. Each of these measures has an important part to play in the strategy to reduce the problem with C&D materials, minimize environmental impacts and maximize benefits to the community. We look forward to developing a close partnership with the relevant sections of the industry in implementing these measures. However, we wish to caution that if the Government's initiatives to address the problem are not matched with full-fledged voluntary actions from the industry, we may have to resort to legislative means. We will continue to brief the Panel on the problem and progress of the above measures, and we look forward to the support of Members as we work to implement them.

Environment and Food Bureau
November 2000

Historical Data for C&D Materials Produced and Reused (1989 - 1999)



Note: one cubic metre of public fill = about 1.8 tonne

Annex A

Annex B

Approved Reclamation Projects and their Public Filling Capacity

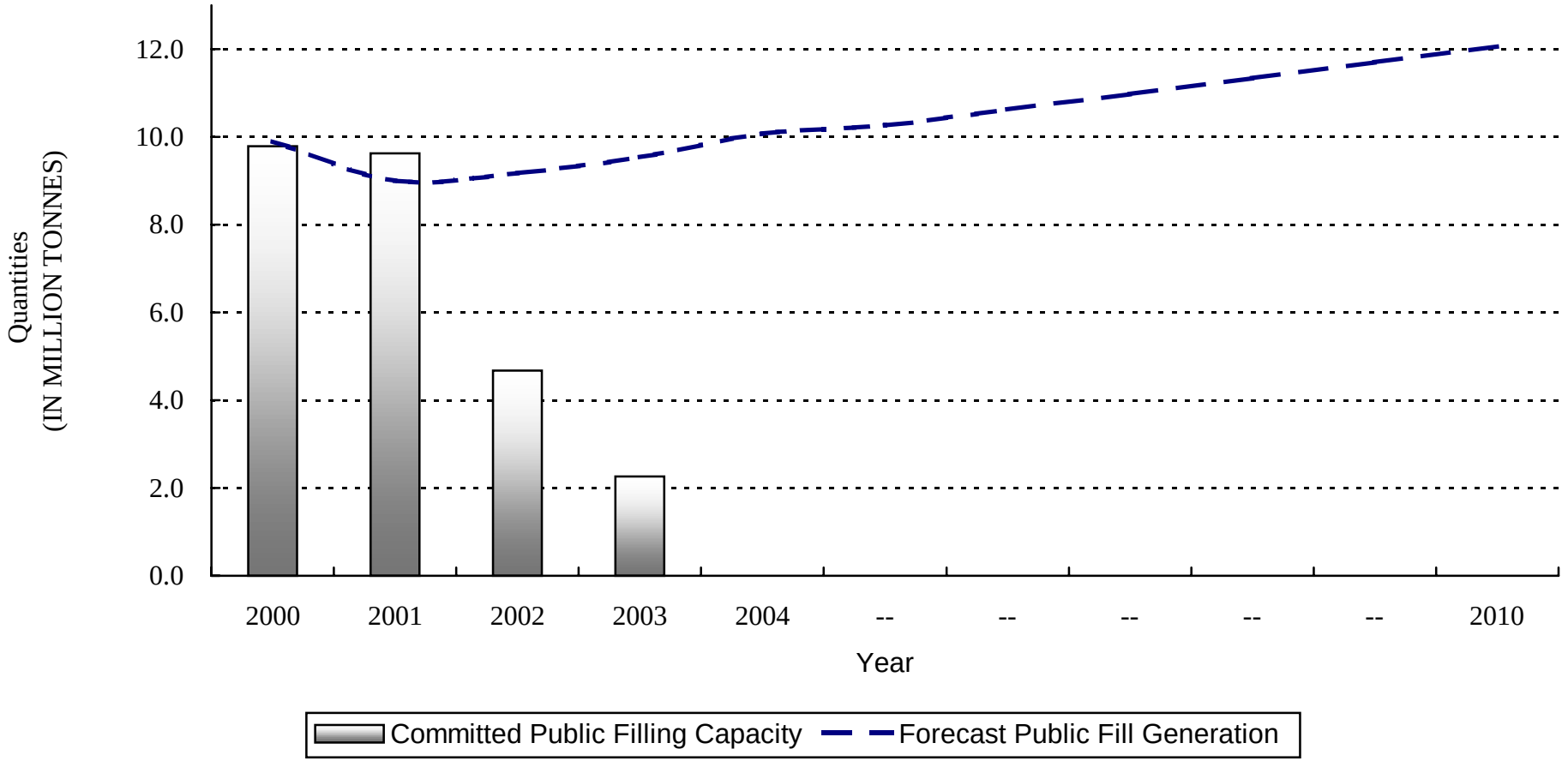
Public Filling Programme Items	Estimated Available Public Filling capacity[1] (tonne)	Expected Period for Accepting Public Fill
Tseung Kwan O Area 137 Reclamation Stage II [2]	0.036 M	Till February 2001
Tung Chung Development Phase 3A Reclamation	1.152 M	Till December 2000
Pak Shek Kok Reclamation Stage III	0.576 M	Till February 2001
Jordan Road Reclamation Phase III [3]	0.612 M	Till October 2001
Pak Shek Kok Reclamation Remaining Works	3.42 M	Till March 2002
Penny's Bay Reclamation Stage I	3.6 M	August 2001 to June 2002
Tseung Kwan O Town Centre Reclamation Phase III Stage II	1.98 M	March 2001 to August 2001
Tuen Mun Area 38 Reclamation Stage II	6.66 M	July 2001 to October 2003

[1] Capacity as at 1 October 2000. One cubic metre of public fill is about 1.8 tonne

[2] Even after sufficient public fill is received in October 2000 for the reclamation, the public filling area would still be operated till February to provide public fill to other reclamation projects including Penny's Bay and Jordan Road.

[3] Although public fill was used in the Jordan Road Reclamation, it was not declared as a public filling area to receive direct disposal from dump truck.

Forecast of Public Fill Generation and Capacity
2000 - 2010



Annex C