For Discussion
on 11 June 2013

Legislative Council
Panel on Food Safety and Environmental Hygiene

Marine Fish Culture in Hong Kong

Purpose

We last briefed Members in July 2012 on the state of the review surrounding the moratorium on the issue of new fish culture licences and raft area extensions in existing fish culture zones (FCZs) and designation of new FCZs. This paper briefs Members on the outcome of the review.

The Review

2. On grounds of environmental impact, there has been a general moratorium since 1990 on the issue of new fish culture licences and raft area extensions in the existing FCZs. At the meeting of 11 July 2012, we briefed Members on the review that was then being undertaken (on the question of whether the moratorium remains appropriate in present-day circumstances) as per the paper at **Appendix I**. Members welcomed the review and expressed support for the proposed measures to promote the sustainable development of the local fisheries industry.

3. We assessed the environmental acceptability of mariculture in existing FCZs using WATERMAN[Note 1], a computer database / modelling system. The outcome of the assessments tallied with the conclusion of a previous consultancy study[Note 2] commissioned by the Environmental Protection Department (EPD), namely that if the then existing fish farms would operate in line with their recommendations (including reduction in

Note 1: WATERMAN is a computer database / modelling system developed by the University of Hong Kong with the assistance of AFCD on the water environment of Hong Kong. Its fisheries management system provides objective and scientific assessments on the environmental acceptability of existing and potential FCZs, which in turn allow us to determine the carrying capacity of these zones.

Note 2: Assessment of the Environmental Impact of Marine Fish Culture in Hong Kong. Ove Arup and Partners (1990).

standing stock and raft area; improved husbandry practices; replacement of trash fish by pellet feed; reduction of pollutant input from garbage and cleaning of cages; prohibition of dwellings on rafts and periodic movement of rafts for sediment recovery), most of these existing fish farms were or would be environmentally acceptable. There is, therefore, a place for the mariculture industry in the overall utilisation of Hong Kong's coastal waters.

4. Given the technical advances in farming techniques and strengthening of regulation measures, the marine environment in the FCZs has improved in the past two decades. The changes in the operational mode and business environment of local fish culture activities, which help reduce the pollutants released in FCZs and improve the marine environment in their vicinity, include –

(a) using whole trash fish and pellet feed instead of minced trash fish, resulting in a significant reduction in pollution loading due to less leaching and feed wastage;

(b) the elimination of domestic refuse from fish farms by banning dwellings on rafts; and

(c) specially designed artificial reefs known as biofilters have been deployed at some FCZs. Many animals growing on biofilters are filter feeders feeding on micro-organisms in water. They clean water by removing nutrients and suspended particles through the filter feeding activities.

Apart from the above changes, drop-outs, cancellation of licences had left 1 008 licensees operating in 26 FCZs in December 2012, relative to 1 792 licensees in 28 zones in June 1989 (i.e. a 44% reduction in the number of licensees). During the same period, the total licensed raft area had been reduced from 50 ha to 29 ha (i.e. a 42% reduction). Also, there had been a reduction in the average stocking density of marine fish farms in 2010 to 6 kg per square metre, which is lower than the figure of 18 kg per square meter prevailing in 1989 and is in compliance with the recommended stocking density of 10 kg per square metre in EPD's consultancy study[Note 2]. An optimal stocking density not only minimises possible impact on the environment, but also reduces the risks associated with fish diseases due to overcrowding. All of these have contributed to a significant reduction in nitrogen loading from mariculture activities into the local waters in the last two decades, namely dropping from an estimated 2 163 kg per day in 1990 to 246.6 kg per day in 2011. In view of the above changes and the findings of WATERMAN, mariculture, if pursued with adequate good practices, is

now considered an environmentally acceptable activity[Note 3].

Way Forward

5. With a view to utilising the surplus carrying capacity, and at the same time encouraging advances in technology and best practices in the industry, Agriculture, Fisheries and Conservation Department (AFCD) plans, as a start, to –

(a) issue new marine fish culture licences in three FCZs (i.e. O Pui Tong, Wong Wan and Sham Wan FCZs)[Note 4];

(b) expand an existing FCZ (Yim Tin Tsai FCZ), and rearrange and spread out the existing rafts within the expanded zone with no net increase in the total licensed raft area; and

(c) explore the possibility of identifying suitable sites for designation of new FCZs.

6. When issuing the new/revised licences under paragraph 5 (a) and (b) above, we will impose licensing conditions and provide appropriate support that would help encourage the mariculture industry to adopt new technologies and management practices, in the interest of achieving sustainable use of the mariculture environment.

7. We will put in hand studies to closely monitor the mariculture environment after the implementation of paragraph 5 (a) and (b), examine the feasibility of applying the new technologies and management practices thus developed to other FCZs, and identify suitable sites for designation of new FCZs. The outcome of these studies will form the basis for assessing the merits of and the scale of further changes to the moratorium. We are mindful of the possible need to interface with any planned / proposed marine works and other uses of the sea (such as navigation channels), and will endeavour to protect the marine environment and to strike a reasonable balance in moving forward.

Note 3: Further details of these techniques and measures are given in paragraphs 7 to 14 of the Panel Paper at Appendix I.

Note 4: It is anticipated that about 30 new marine fish culture licences will be issued at the initial stage.

Issue of New Licences

8. AFCD plans to issue new licences in three FCZs (i.e. O Pui Tong, Wong Wan and Sham Wan FCZs) that are identified to have surplus carrying capacity. Details of the zones are at **Appendix II**. We estimate that about 30 new fish culture licences could be issued through a one-off allocation exercise at this stage.

9. Applicants would be required to provide business plans in support of their applications. The plans should show clearly how the proposed mariculture business could achieve sustainable use of the mariculture environment. The applications would be evaluated according to the assessment criteria set out in **Appendix III**.

10. Each successful applicant will be granted a licence for a farm size of not more than 300 square metres for a period of three years. Additional conditions may also be imposed on the new licences to ensure smooth and proper implementation of the scheme, and that the operation of the farm will be consistent with the intended purpose. Such conditions may include (a) requiring the new licensed areas to be actively used for mariculture; (b) mandating licences to be non-transferable; (c) prohibiting recreational fishing [Note 5]; (d) requiring the fish farms to join the Accredited Fish Farm Scheme [Note 6] set up by AFCD; and/or (e) restricting the use of trash fish unless under and in accordance with the prior approval of the Director of Agriculture, Fisheries and Conservation (DAFC). Failing to comply with the licensing conditions may result in cancellation of the licence. Upon expiry of the current licence term, DAFC may or may not further renew a licence, taking into consideration environmental acceptability. DAFC may impose any conditions as he thinks fit if the licence is renewed. Where appropriate, the additional conditions may be imposed on existing licences upon renewal.

11. AFCD will, as appropriate, provide support services and

Note 5: Under a scheme introduced by AFCD in 2002, fish farmers are allowed to operate leisure fishing business on their fish rafts, subject to compliance with conditions designed to protect the mariculture environment and public safety. Under the conditions to be imposed in the estimated 30 new licences, the licensees will not be allowed to operate such businesses.

Note 6: Accredited Fish Farm Scheme is a voluntary programme set up by AFCD to enhance the aquaculture industry's competitiveness. Participating farms are required to adopt good practices to raise farms' hygiene standards and fish quality. Tests, including analyses of drug residues and heavy metals in fish, are conducted to ensure that the cultured fish are safe for consumption before they are sold.

implement additional environmental measures with a view to creating a favourable operating environment in these FCZs. These may include the deployment of biofilters, installation of equipment for continuous monitoring of water quality, provision of utility rafts as platforms for communal usage, and provision of technical guidance and vocational training, etc.

12. The total additional farm areas in each of the three FCZs will not exceed the environmental acceptability determined by WATERMAN (as stipulated in **Appendix II)**. AFCD will regularly collect information, including environmental information like water quality data for FCZs, during the three-year licensing period to confirm / refine the findings of WATERMAN and make sure that the scheme would not cause unacceptable impact to the marine environment.

Expansion of Existing FCZs

13. AFCD plans to expand an existing FCZ (Yim Tin Tsai FCZ) with current stock beyond its carrying capacity. There will be no net increase in the total licensed raft area. The existing rafts will be rearranged and spread out within the expanded zone, which will help the existing overcrowded FCZ achieve a lower stocking density, as a good aquaculture practice. Not only does this help minimise possible impact on the environment, but also reduces the risks associated with fish diseases due to overcrowding. Revised licences will be issued to existing licence holders to effect the rearrangement and spreading out of existing rafts. The expanded zones may be subject to similar environmental measures as described in paragraph 11 above as appropriate.

14. AFCD will engage a consultancy later this year to evaluate the technical and environmental feasibility, taking into consideration the requirements of the Environmental Impact Assessment Ordinance (Cap. 499) ("EIAO"). The outcome of the study, which will become available in late 2014, will be used for designation of the expanded FCZ and specification of sites therein. This will be effected through legislative amendment by way of order of DAFC published in Gazette in accordance with the Marine Fish Culture Ordinance (Cap. 353) in early 2015 as tentatively scheduled. In parallel, we will study the possibility and merits of expansion in other existing FCZs having regard to the Yim Tin Tsai FCZ experience.

Identification of Suitable Sites for Designation of New FCZs

15. Similar to issuing of new fish culture licences and expansion of FCZs, environmental acceptability is the prime concern when considering designation of new FCZs. In moving forward, we will be guided by the

principle that any proposed measures to be taken should satisfy the prevailing test of environmental acceptability.

16. Sites for designation of new FCZs will first be short-listed through desktop studies, with their carrying capacity evaluated against relevant environment and other statutory requirements using the latest available data and modelling techniques. In-depth feasibility study and environmental impact assessment will then be carried out for the short-listed sites. Should a new FCZ fall within the definition of a designated project requiring an environmental permit [Note 7], AFCD will ensure that all statutory environmental requirements (including the conditions set out in the permit) will be met when taking forward any proposed measures.

Pubic Consultation

17. AFCD consulted academia, green groups, the trade and relevant stakeholders on whether the moratorium remained appropriate in present-day circumstances. The proposals were welcomed by most of the parties AFCD engaged.

18. We received mixed views from existing mariculturists. Some objected to issuing new licences in existing FCZs to newcomers, as the new comers would compete with the existing licence holders for the limited natural resources and business opportunities. Some supported issuing additional licences to existing licence holders for them to expand their business. Others objected to issuing new licences in any manner. They claimed that as marine fish culture licences were transferable, issuing new licences would be unfair to those who had purchased their licences through the open market. Some, however, believed that mariculture in Hong Kong as a whole would be revitalised as a result of the issue of new licences. Most existing mariculturists took the view that fishermen affected by the trawl ban should not have priority over others in obtaining the new licences as they had already been granted ex-gratia allowance as a result of the ban.

19. In general, the academia and green groups considered that Hong

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Note 7: Under section 9 of the EIAO, a person is required to have an environmental permit for the construction and operation of a designated project. According to section M.1 of schedule 2 to the EIAO, for a FCZ (a) that is more than 5 ha in size; or (b) a boundary of which is less than 500 m from the nearest boundary of an existing or planned marine park or marine reserve, or bathing beach, is a designated project. The construction or operation of a designated project is subject to the conditions set out in an environmental permit issued for the project by the Director of Environmental Protection.

Kong had the potential to develop a sustainable mariculture industry, and the Government could take this opportunity to assist the industry to embrace new technologies and management regimes when issuing new licences. They similarly expressed the view that new licences should be subject to stringent control in relation to farming practices so as to improve environmental sustainability.

Advice Sought

20. Members will be invited to give their views on the proposals set out in paragraphs 5 to 16 above.

Food and Health Bureau
Agriculture, Fisheries and Conservation Department
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Legislative Council
Panel on Food Safety and Environmental Hygiene

Marine Fish Culture in Hong Kong

PURPOSE

On grounds of environmental impact, there has been a general moratorium since 1990 on the issue of new fish culture licences and raft area extensions in existing fish culture zones (FCZs) and designation of new FCZs. We are reviewing the moratorium, as recommended by the Committee on Sustainable Fisheries. This paper briefs Members on the current state of the review, including the development of an analytical tool for assessing the environmental acceptability of FCZs.

THE COMMITTEE ON SUSTAINABLE FISHERIES

2. In December 2006, the Government established the Committee on Sustainable Fisheries (the Committee) to study the long term directions, goals and strategy for the sustainable development of the local fisheries industry. In its report released in May 2010, the Committee observed that apart from assisting fishermen to develop or switch to modernised and sustainable modes of operation, further measures should be put in place to manage fishing efforts, including banning trawling, in Hong Kong waters. The Committee recommended, inter alia, a review of the moratorium to facilitate fishermen to switch from capture fisheries to mariculture. Mariculture is considered a practical alternative for capture fishermen to make a living as their artisan skills would be useful in farming marine fish.

3. In the 2010-11 Policy Address, the Chief Executive announced that the Government would implement a package of fisheries management measures, including banning trawling in Hong Kong waters through legislation in order to restore our seabed and marine resources as soon as possible. To take forward the trawl ban, the Government introduced the Fisheries Protection (Specification of Apparatus)(Amendment) Notice 2011 (Amendment Notice) into LegCo in March 2011. The Subcommittee on the Amendment Notice was briefed on measures being taken to assist the fishing community. In that context, we reported that the Agriculture, Fisheries and Conservation Department (AFCD) was engaging relevant Bureaux/Departments to lay the ground work for a review of the moratorium on the issue of new licence for mariculture operations.

THE MORATORIUM IN 1990

4. Before 1980, marine fish culture used to be conducted in an *ad hoc*, unregulated manner. Since 1982, marine fish culture has come under the purview of the Marine Fish Culture Ordinance (Cap. 353) which requires all marine fish culture activities to operate under licence in designated FCZs. At that time, there were 24 designated FCZs. As the industry continued to grow, there were 1 810 licensees operating in 28 FCZs in December 1988, with another 1 298 applications for fish culture licences on the waiting list, pending the identification of suitable new FCZs / raft areas.

5. Meanwhile, there was a growing concern in the Government and the community that not only would mariculture suffer from poor water quality if the size of the industry continued to grow, it would also generate pollutants degrading the marine environment. In 1989, the Government commissioned a consultancy to assess the environmental impact of mariculture in Hong Kong. As an interim measure, no new FCZs were to be designated, except for forced re-site necessitated by public works. In 1990, the Government endorsed various recommendations from the consultancy, including :

(a) the continuation of the moratorium on the designation of new FCZs; and

(b) stringent restrictions on the grant of new licences or raft area extensions in existing zones.

Since then, only one new FCZ has been designated to accommodate mariculturists from a FCZ degazetted to make way for a public works project; extension of zone areas has been permitted in six FCZs solely for the purpose of allowing reduction of raft density; and no new fish culture licence has been issued.

DEVELOPMENTS SINCE 1990

6. In the past 20 years, there have been changes in the operational mode and business environment of local fish culture activities, which help reduce the pollutants released in FCZs and improve the marine environment in their vicinity. Some pertinent developments are set out in the ensuing paragraphs.

Reduction in raft area

7. The environment has improved in most FCZs as a result of drop-outs, cancellation of licences, and management measures which encourage the relocation of fish culture rafts from overcrowded FCZs to thinly populated zones. As at May 2012, there were 1 012 licensees operating in 26 FCZs, relative to 1 792 licensees in 28 zones in June 1989 (i.e. a 44% reduction in the number of licensees). During the period, the total licensed raft area has also been reduced from 50 ha to 29 ha (i.e. a 42% reduction). Annex A gives further information about the licensed raft area of the 26 FCZs. A map showing the locations of the FCZs is at Annex B.

Improvement in feeding regime

8. Minced trash fish was once the commonest fish feed used by local fish farmers. This is considered a major source of pollution from mariculture activities. Under the continuous efforts of AFCD, minced trash fish is now seldom used for grow-out stage. Instead, whole trash fish and pellet feed are now used for larger fish, resulting in a significant reduction in pollution loading from mariculture due to less leaching and feed wastage. The surge in the price of trash fish has also provided an incentive for fish

farmers to minimise feed wastage by controlling ration size and frequency of feeding. We anticipate the usage of pellet feed for grow-out stage will further increase in the coming years due to the continuous increase in the price of trash fish.

Refuse / fish carcass collection and disposal

9. Domestic refuse from fish farms is now minimal as dwellings on raft are forbidden. Clean-up campaigns, undertaken jointly by District Offices, Marine Department and mariculturist associations, have also been successful in reducing refuse. Fish farmers are now more aware of the importance of proper disposal of fish carcasses. Recognising that fish carcasses are the major source of fish disease vectors, most fish farmers now dispose of fish carcasses on land in refuse collection points after applying disinfectants. An interdepartmental procedure on the disposal of fish carcasses after massive fish kills is in place to assist fish farmers to dispose of fish carcasses after such incidents.

Enhanced law enforcement

10. After a series of intensive enforcement against domestic dwellings on rafts between 1989 and 1993, and as a result of the continuous / regular patrol and monitoring of FCZs by AFCD since then, illegal dwellings are now virtually nonexistent. AFCD has been maintaining vigilance in curbing resurgence of such irregularities on fish rafts.

Reduction in stocking density

11. As a good aquaculture practice, AFCD encourages fish farmers to adopt an optimal stocking density. An optimal stocking density not only minimises possible impact on the environment, it also reduces the risks associated with fish diseases due to overcrowding. The average stocking density of marine fish farms in 2010 was 6 kg per square metre. Not only is this much lower than the figure (of 18 kg per square metre) prevailing in 1989, it is in compliance with the recommended stocking density of 10 kg per square metre which stemmed from a consultancy study commissioned by the Environmental Protection Department in 1990 [Note 1].

Note 1: Assessment of the Environmental Impact of Marine Fish Culture in Hong Kong. Ove Arup and Partners (1990).

Biofilters

12. To further enhance the environmental management of FCZs, specially designed artificial reefs known as biofilters have been deployed at some FCZs. Many animals growing on biofilters are filter feeders feeding on micro-organisms in water. They clean water by removing nutrients and suspended particles through its filter feeding activities. The benefits of biofilters have been confirmed by local researchers. Their research data reveal that benthic community composition at biofilter deployment sites is more diverse than control sites at FCZs and is similar to control sites without fish farming activities [Note 2]. These indicate that biofilters can be used to effectively mitigate the possible impact of marine fish culture activities on the marine environment. Furthermore, fish and shellfish, attracted to aggregate and propagate around biofilters, feed on the feed remains and fish excreta from fish culture activities. This in turn enhances fisheries resources in the zones by transforming potential pollution into potential fisheries production.

13. At present, 34 units of biofilters have been deployed at the Lo Tik Wan, Kau Sai and Sham Wan FCZs. AFCD has recently commissioned a study to improve the design of biofilters with a view to deploying some at zones with shallower water. The department will also continue to explore the opportunities for deploying more biofilters at suitable FCZs as an added environmental management measure.

Reduction in pollution loading

14. Partly as a result of the developments mentioned in paragraphs 7 to 13 above, there has been a significant reduction in nitrogen loading from mariculture activities into the local waters in the last two decades. Nitrogen loading from mariculture in Hong Kong has dropped from an estimated 2 163 kg per day in 1990 [Note 1] to 246.6 kg per day in 2011 [Note 1].

Note 2: Final Report on the Provision of Contract Research to Study the Effect of Biofilter Deployment on the Water Quality, Sediment and Benthic Community at Sham Wan Fish Culture Zone. City University of Hong Kong (2009).

WATERMAN

15. The University of Hong Kong, with the assistance of AFCD, has recently developed a computer database / modelling system on the water environment of Hong Kong, named WATERMAN. Amongst its four major components, the fisheries management system provides objective and scientific assessments on the environmental acceptability of existing and potential FCZs, which in turn allow us to determine the carrying capacity of these zones. Carrying capacity refers to the maximum allowable fish stocking density for the sustainable and environmentally acceptable fish farming activities. It is governed by factors such as tidal flushing rate of the site, organic loading from fish farms, and the statutory / indicative water quality objectives applicable to the local waters.

16. WATERMAN adopts a very conservative approach when calculating the carrying capacity of existing FCZs. It has included all the environmental fluctuations captured in the past 10 years from field observations. More importantly, a safety margin equivalent to 95 to 99 percentile of past field data has been applied to ensure that it has taken into account extreme weather, hydrological and environmental scenarios, including slack tides, seasonal stratification and algal blooms. It is a very useful tool for assessing the environmental sustainability and the carrying capacity of FCZs. Initial assessments based on WATERMAN reveal that some FCZs in Hong Kong may have the capacity of holding additional fish stock without compromising the marine environment. In other words, we are probably under-utilising the potential of our FCZs, and there may be room for increasing the total stocking volume for sustainable development of the marine fish culture in Hong Kong.

WAY FORWARD

17. In moving forward, we will take into account any comments that Members may have on this subject, the findings of WATERMAN and other relevant factors. We are guided by the principle that any proposed measures should satisfy the prevailing test of environmental acceptability. Our plan is to consult relevant bureaux / departments, the trade and relevant stakeholders in the near future on whether the moratorium on the issue of new fish culture licences in FCZs with surplus carrying capacity remains

appropriate in present day circumstances, including the possibility of launching a trial scheme that might serve as the basis for assessing the merits of any proposed changes.

ADVICE SOUGHT

18. Members are invited to note and advise on the contents of this paper.

Food and Health Bureau
Agriculture, Fisheries and Conservation Department
June 2012

Annex A **Licensing details of the 26 designated fish culture zones**

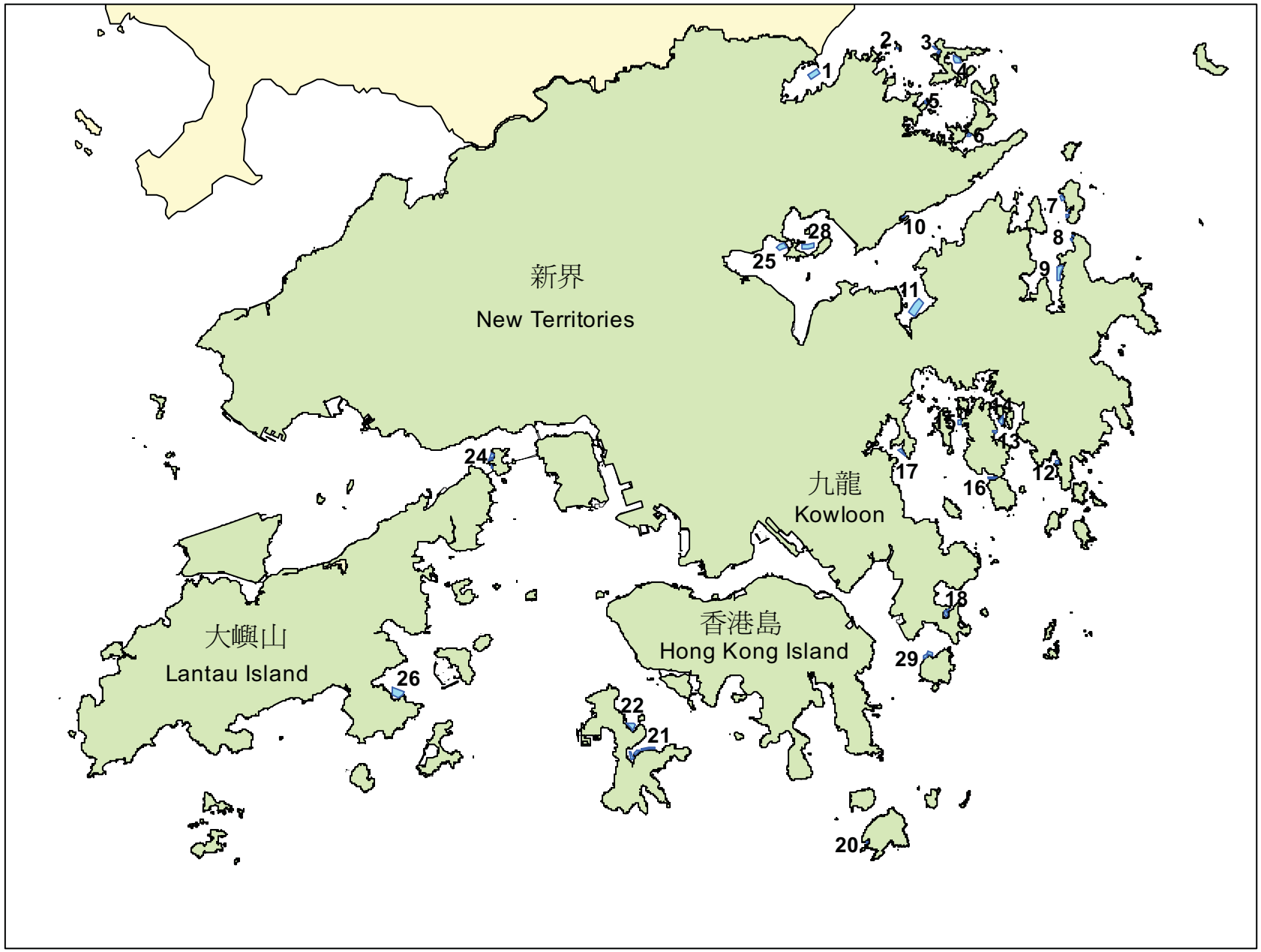
Fish Culture Zone	Zone area (sq.m)	Historical maximum licensed area (sq.m)	Current licensed area (as at May 2012) (sq.m)	Percentage of reduction of licensed area
Ap Chau	4,200	1,639	453	72%
Cheung Sha Wan	214,200	25,942	16,139	38%
Kai Lung Wan	27,045	7,008	5,820	17%
Kat O	32,400	11,968	4,172	65%
Kau Lau Wan	11,200	4,320	1,265	71%
Kau Sai	46,200	14,162	13,057	8%
Leung Shuen Wan	17,300	8,173	6,541	20%
Lo Fu Wat	5,400	4,062	1,578	61%
Lo Tik Wan	109,200	32,539	23,225	29%
Ma Nam Wat	40,100	34,807	5,009	86%
Ma Wan	46,300	14,704	14,554	1%
O Pui Tong	105,600	49,764	6,684	87%
Po Toi	3,000	640	272	58%
Po Toi O	38,200	9,688	4,330	55%
Sai Lau Kong	7,200	2,605	327	87%
Sha Tau Kok	180,000	20,312	17,272	15%
Sham Wan	180,600	29,764	16,800	44%
Sok Kwu Wan	141,200	31,803	26,796	16%
Tai Tau Chau	62,800	19,670	12,540	36%
Tap Mun	72,400	23,686	11,548	51%
Tiu Cham Wan	17,000	13,900	1,355	90%
Tung Lung Chau	80,000	23,929	12,700	47%
Wong Wan	22,500	7,892	1,286	84%
Yim Tin Tsai	136,300	32,414	23,950	26%
Yim Tin Tsai (East)	149,500	37,134	21,294	43%
Yung Shue Au	342,000	64,458	43,103	33%
Total:	2,091,845	526,983	292,070	*******

Annex B

Fish Culture Zones in Hong Kong
香港魚類養殖區

Fish Culture Zone 魚類養殖區

1	Sha Tau Kok	沙頭角
2	Ap Chau	鴨洲
3	Kat O	吉澳
4	O Pui Tong	澳背塘
5	Sai Lau Kong	西流江
6	Wong Wan	往灣
7	Tap Mun	塔門
8	Kau Lau Wan	較流灣
9	Sham Wan	深灣
10	Lo Fu Wat	老虎笏
11	Yung Shue Au	榕樹凹
12	Leung Shuen Wan	糧船灣
13	Tiu Cham Wan	吊杉灣
14	Tai Tau Chau	大頭洲
15	Kai Lung Wan	雞籠灣
16	Kau Sai	滘西
17	Ma Nam Wat	麻南笏
18	Po Toi O	布袋澳
20	Po Toi	蒲台
21	Sok Kwu Wan	索罟灣
22	Lo Tik Wan	蘆荻灣
24	Ma Wan	馬灣
25	Yim Tin Tsai	鹽田仔
26	Cheung Sha Wan	長沙灣
28	Yim Tin Tsai (East)	鹽田仔(東)
29	Tung Lung Chau	東龍洲



Appendix II

Licensing details of O Pui Tong, Wong Wan and Sham Wan fish culture zones

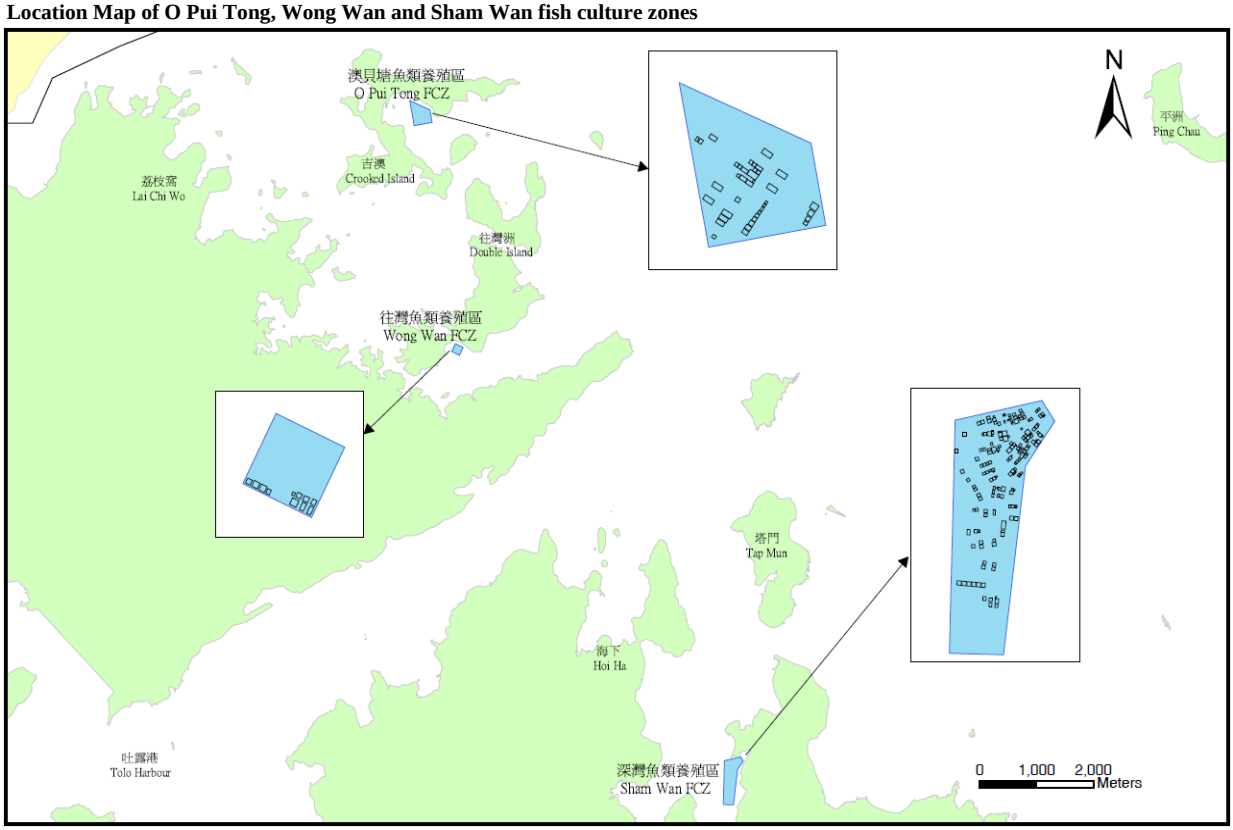
Fish Culture Zone	Zone area (sq.m)	Historical maximum licensed area (sq.m)	Current licensed area (as at December 2012) (sq.m)	Percentage decrease of licensed area over historical maximum
O Pui Tong	105,600	49,764	7,494	85%
Wong Wan	22,500	7,892	1,286	84%
Sham Wan	180,600	29,764	15,990	46%

Estimated carrying capacity and additional farming area at O Pui Tong, Wong Wan and Sham Wan fish culture zones

Fish Culture Zone	Historical maximum stocking (kg)	Stocking in 2011 (kg)	Estimated carrying capacity (kg)	Additional carrying capacity (kg)	Estimated additional farming area	Proposed additional farming area (sq.m)
O Pui Tong	895,752	40,657	101,400	60,743	3,037	1,697
Wong Wan	142,056	0	20,500	20,500	1,025	805
Sham Wan	535,752	85,702	168,800	83,098	4,155	2,220

* Assume the stocking density is 20 kg per sq. m

Location Map of O Pui Tong, Wong Wan and Sham Wan fish culture zones



Appendix III

Proposed Assessment Criteria for Evaluating Applications for New / Revised Licences

Assessment area	Assessment Criteria
Potential in promoting sustainable development of aquaculture	Scale of production – industrial production scores higher than family based production.
	Level of integration – a business demonstrating an integrated service chain that supports local peripheral industries (e.g., feed and fry supply, equipment suppliers, restaurants) scores higher.
	Technological innovation – a venture adopting new technologies which enables environmentally friendly, efficient and economic aquaculture production scores higher.
	Market potential of aquatic product – species with higher demand, and lucrative and diverse markets scores higher.
Production feasibility	Design and construction of production system – a proven aquaculture production design and farm layout in a scale compatible to the production target scores higher.
	Feasibility of operation – a business plan with adequate appreciation on the biological factors of the chosen species and the culture method, including technical aspects such as stocking time, stocking rates, fingerling sources, anticipated feed rates, and harvesting strategy scores higher.
	Schedule of project implementation – a business plan specifying the approach for ensuring that the operation does not deviate from the business objectives scores higher.
	Extent of utilisation of culture area – a fish farm with greater fish stocking area scores higher.

Environmental sustainability	Strategies in reducing pollution and ensuring food safety – a business plan demonstrating proactive management strategies in water quality, pollution, product quality and safety control scores higher.
	Strategies in preventing production loss problems – a business plan demonstrating proactive management strategies in minimising risk of production loss due to oxygen depletion, winter kill, parasites, disease, predators, cannibalism, etc. scores higher.
Technical and management capability	Necessary knowledge and skill – operators with adequate academic or technical capabilities in aquaculture production score higher.
	Past experience in mariculture – operators with more experience in aquaculture score higher.
	Staff deployment – a business plan specifying roles and responsibilities of members of the production team and demonstrating adequate level of effort required for each member scores higher.
	Human resources – a business plan demonstrating sound professional and technical manpower input that meets the proposed scale of operation scores higher.
Priority	Applications from wait-listed applicants for marine fish culture licence or trawler owners affected by the trawl ban will be accorded higher priority.