

Pioneering “Comprehensive Urban Landscape Technology” (CULT):

an integrated system model for urban sustainability as community amenity in a compact urban environment

World Sustainable Built Environment Conference

WBSE 2017 Hong Kong

06 June 2017

Thomas Chung

Associate Professor

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The Chinese University of Hong Kong



F l o a t i n g F i e l d s
蛇 口 浮 田

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I. INTRODUCTION: BACKGROUND AND CONTEXT

Floating Fields 蛇口浮田



Productive pond-scape and leisure public space, integrate aquaponics and algae cultivation, water filtering and sustainable food production

Floating Fields

蛇口浮田



Productive leisure eco-water landscape

Productive pond-scape and leisure public space, integrate aquaponics and algae cultivation, water filtering and sustainable food production

Floating Fields

蛇口浮田



概念 · 策劃 · 建築設計
Concept · Organizer · Architect



SCHOOL OF ARCHITECTURE
THE CHINESE UNIVERSITY OF HONG KONG
香港中文大學建築學院

鍾宏亮 香港中文大學建築學院副教授
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Commissioner

深圳城市\建築雙年展組委會
Shenzhen Bi-City Biennale Organizing Committee

藻塘項目團隊
Algae Cultivation Co-creator



香港公開大學
THE OPEN UNIVERSITY
OF HONG KONG

香港公開大學微藻研究團隊
何建宗教授, 香港公開大學科技學院院長
黃儀強先生, 香港公開大學科技學院助理講師
陳嘉坤, 陳俊傑, 張嘉佑, 何庭康, 李耀麟, 謝俊耀, 姚莒葵
Microalgae Research Team, The Open University of Hong Kong
Prof. HO Kin Chung, Dean, School of Science & Technology
Mr. WONG Yee Keung, Assistant Lecturer
CHAN Ka Kwan, CHEN Jun Jie, CHEUNG Ka Yau, HO Ting Hong,
LEE Yiu Lun, TSE Chun Yiu, YIU Kui Fan

場地及建設贊助
Venue and Construction Sponsor

招商局蛇口工業區控股股份有限公司
China Merchants Shekou Industrial Zone Holdings Co., Ltd.



Background

Revitalise disused factory,
Recover natural water source,
Refer architectural grid



near Futian area, Shenzhen, 40 years ago



Re-living the city
Bio-social urbanism in the 21st century



Mulberry-dyke Fish Pond, PRD tradition 桑基鱼塘：珠三角基塘农耕文明



Filtering Ponds 过滤走廊：藻类及滤水植物 作净水及景观



Background Floating Plots · Aquaponics 浮田：鱼菜共生



Deep Bay floating fields, oyster-growing tradition 後海灣/深圳灣鹹淡水交界浮排豪蚌養殖傳統

2. CONCEPT AND DESIGN



Floating Fields

Recycling architecture as productive leisure pondscape

- 1 Water Lily Pond
- 2 Koi Carp Pond
- 3 Duck Pond
- 4 Floating Fields • Aquaponics
- 5 Floating Fields • Mulberry Fishpond
- 6 Silkworm Pavilion
- 7 Mulberry bushes
- 8 Vegetables
- 9 Algae Pavilion & Ponds
- 10 Filtering Ponds
- 11 Rooftop Farming Plots
- 12 Winter Wheat (including rooftops)
- 13 Brick bridge / platform
- 14 Workshop + Storage



Floating Fields

蛇口浮田



Productive leisure eco-water landscape

Concrete ground broken up to form larger ponds; crushed rubble recycled as gravel to fill pathways; productive ponds formed from concrete bricks; pathways, platform, bridge with steps, benches and pavilions to create a walkable landscape, public space combining food production and leisure.

3. ECO-WATER CYCLE AND FLOATING PLOTS



- 1 Water Lily Pond
- 2 Carp Pond
- 3 Duck Pond
- 4 Floating Fields • Aquaponics
- 5 Floating Fields • Mulberry Fishpond
- 6 Silkworm Pavilion
- 7 Algae Ponds
- 8 Filtering Ponds

Ecological Water Cycle

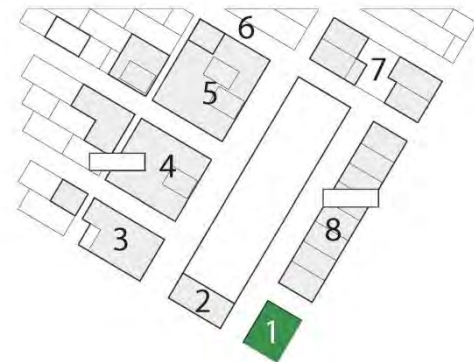
The project's water cycle can be self-sustained. Waste water first enters the algae ponds, cleaned by the filtering ponds, and purified in the water lily pond. Then it flows into the carp pond, duck pond, onto the floating plots and aquaponics and mulberry fishpond areas. The floating plots gives oxygen to the water while partially cleaning it, before going back to start of the cycle. Part of the cleaned water is used for rooftop irrigation.

1



浮 莲 塘

Water Lily Pond



淨水引導回魚塘養殖
Clean water returns
to fish ponds



种植及养殖污水经过滤池塘过滤，
适合浮莲生长
Waste water filtered by
filtering ponds, becomes
suitable for water lily growing

水浮莲作净水及景观
Water lily for filtering
water and viewing

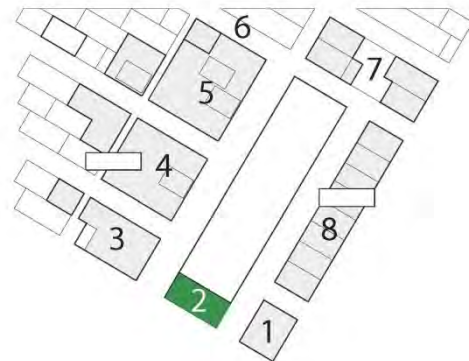


最终净水环节 浮莲 漂浮性水生植物 花色艳丽美观能供应欣赏

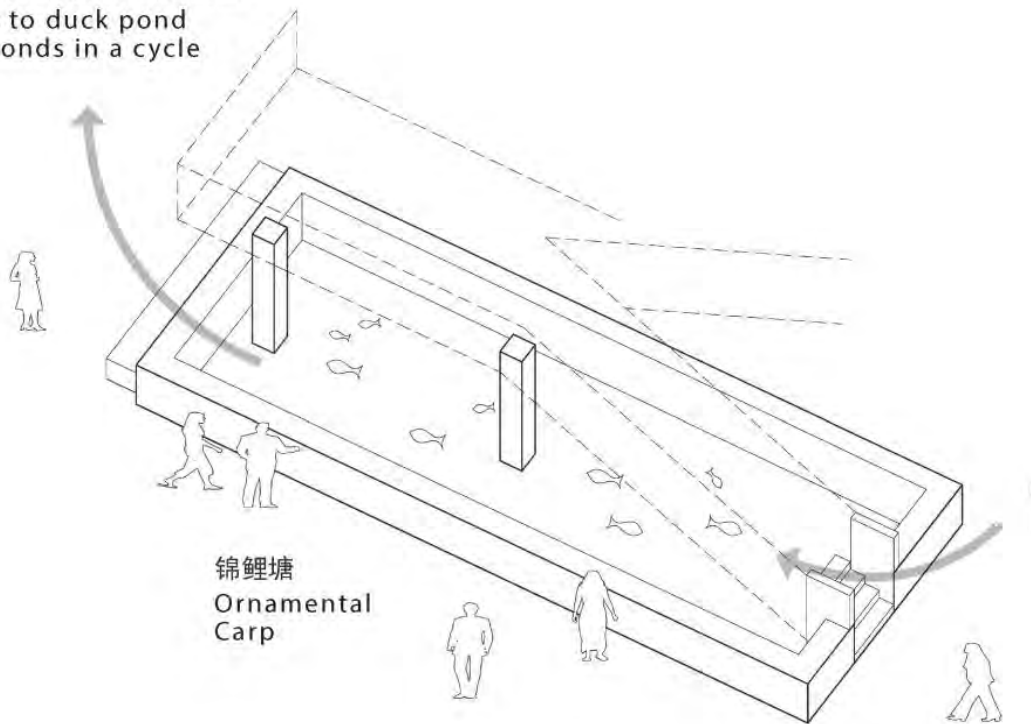
2



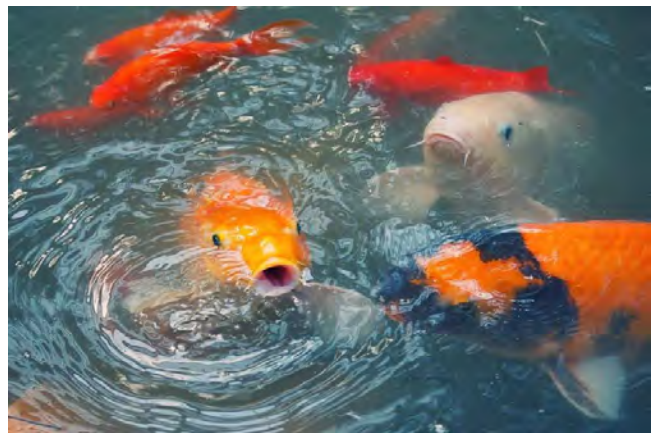
锦鲤塘 Carp Pond



池水继续循环流向鸭塘及其他鱼塘
Water flows to duck pond
and other ponds in a cycle



锦鲤塘
Ornamental
Carp

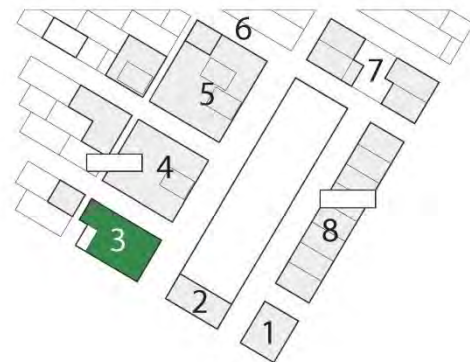


为什么要养锦鲤？ 供观赏用、生命力强、适应性较好

3

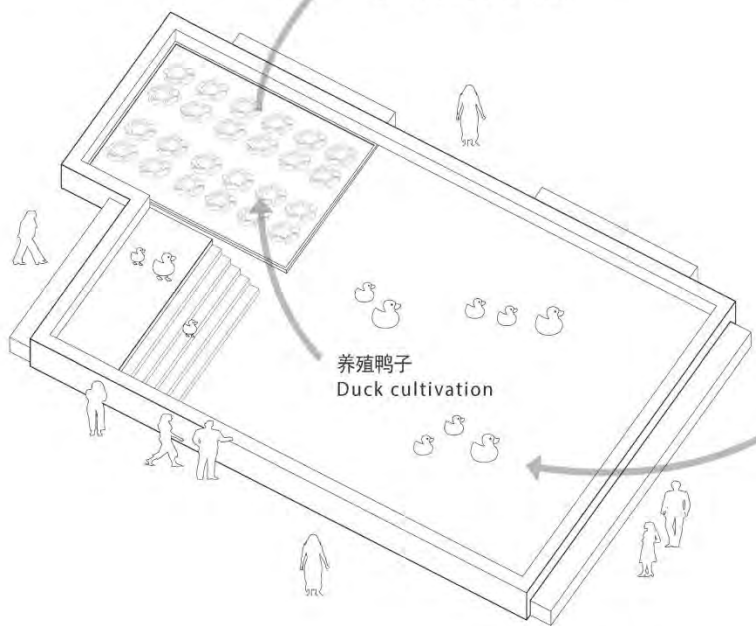


鸭塘 Duck Pond



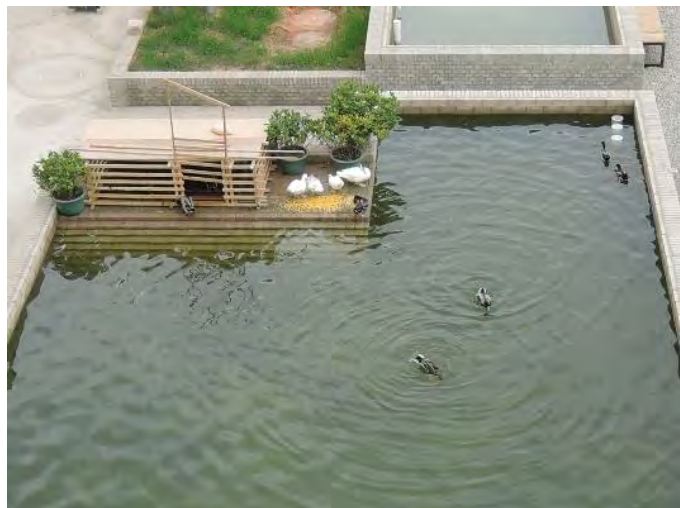
浮田作物吸收鸭便, 水质净化, 也为我们提供食物
Duck droppings absorbed by floating fields, improving water quality and providing food

水循环继续流向其他鱼塘
Water flows to other fish ponds as a cycle

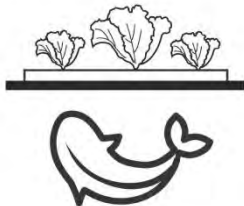


水循环由锦鲤塘流入
water flows in from carp pond

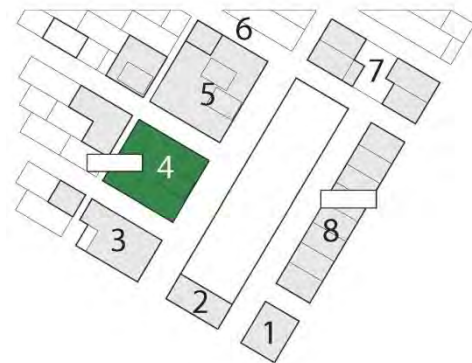
除草、防虫、提供有机肥料
作植物共生体, 浮田周边水面养鸭, 植物动物互利共生, 无公害生产



4



浮田 · 鱼菜共生 Floating Fields · Aquaponics



鱼菜共生
鱼帮菜，菜帮鱼
Synergy of fish breeding
and planting

水质转好, 作物提供
鱼所需要的氧气
Water quality is improved;
provision of oxygen from
plants to fish

有机食用作物
Organic crops growing
on floating fields

水产养殖
Fish breeding

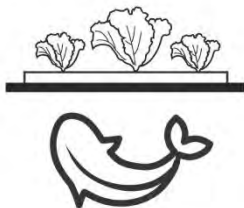
植物吸收鱼便, 净化水质
Absorption of fish excreta
by plants to purify water

鱼类提供有机排泄物给蔬菜
Provision of nutrients from
fish excreta to vegetables



浮田 漂浮水上土地 可节省土地利用, 不需要浇水换水, 不需要添加
农药化肥抗生素生长激素等。鱼帮菜, 菜帮鱼的大自然共生原理

4



浮田 · 鱼菜共生 Floating Fields · Aquaponics



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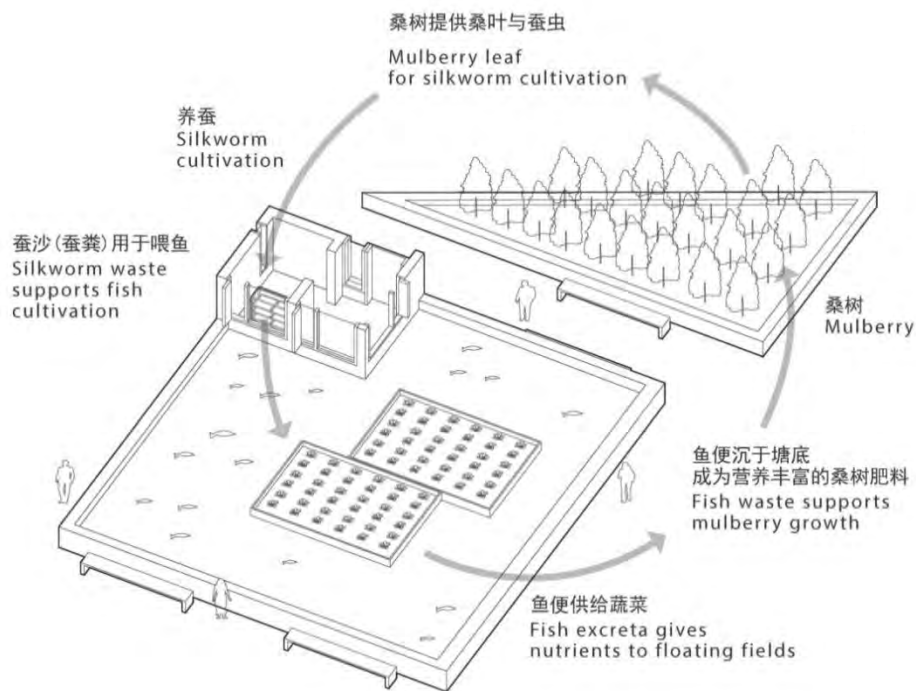
浮田 漂浮水上土地 可节省土地利用, 不需要浇水换水, 不需要添加
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5



浮田·桑基鱼塘

Floating Fields · Mulberry Fishpond



塘内养鱼供食用，塘外植桑用来喂鱼和养蚕，蚕沙喂鱼，塘泥肥桑。鱼、桑、蚕之间营养交错循环，食物链和食物网传递的共同催生良性循环过程。

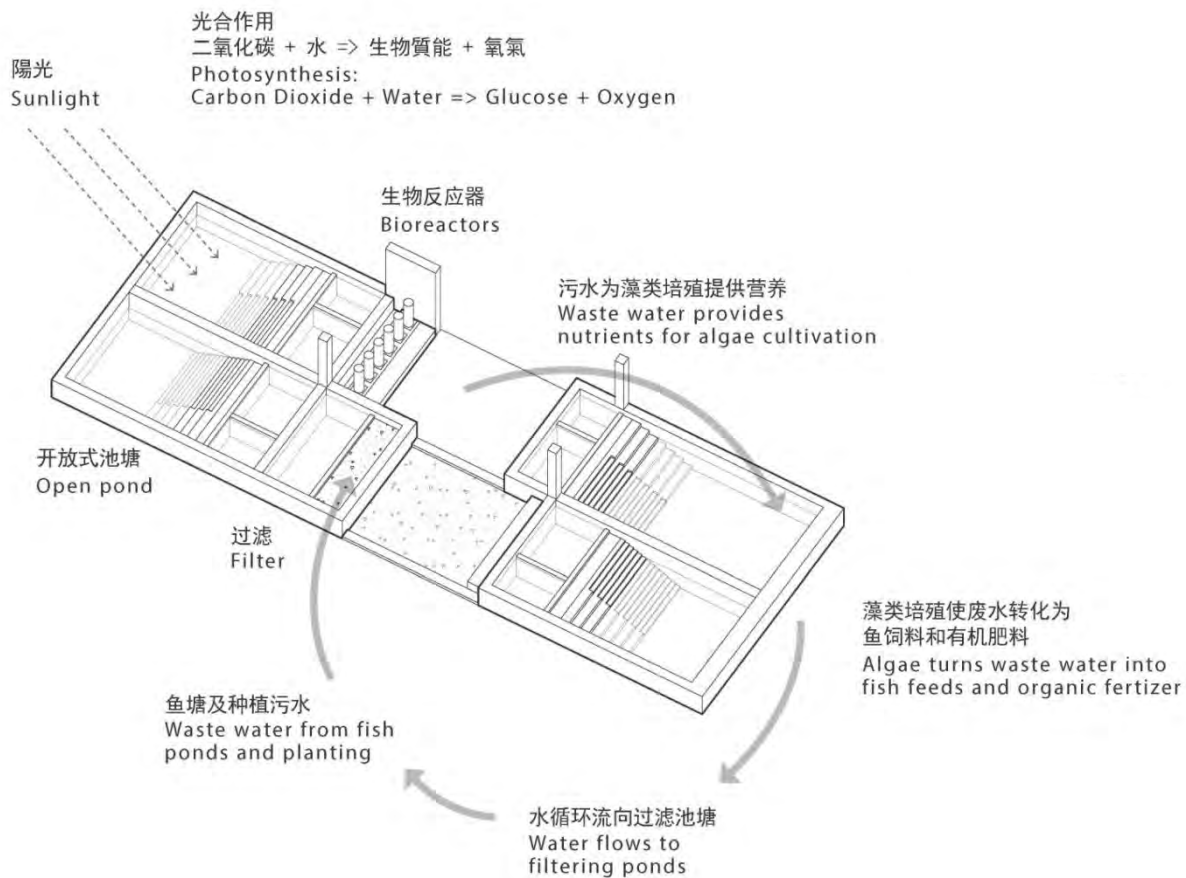


7



藻塘

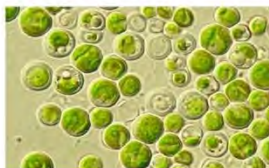
Algae Ponds



7

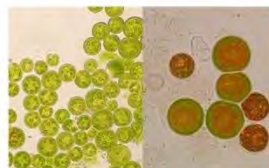


微藻种类



蛋白核小球藻

蛋白核小球藻是一种单细胞淡水真核生物，球形或椭圆形，直径3-8微米。它们含有丰富的叶绿素，能进行有效、快速的光合作用。由于它们含有相当数量的脂类而且容易生长，所以可以利用于生产可再生的生物燃料例如生物柴油。



雨生红球藻

雨生红球藻是一种单细胞淡水真核生物，直径5-25微米。它们能进行光合作用。它们的形态可分为两种，绿色具游动能力的营养细胞及红色无游动能力的孢囊。它们能够具有高含量的虾青素即具有良好抗氧化能力的类胡萝卜素。

微藻养殖流程



1 鱼塘水初步处理

利用砂池过滤以降低杂质及悬浮固体。砂池会堆积2至3种不同大小的砂石，由大至小排列，逐层过滤指定大小的杂质及悬浮固体。



2 初步养殖 光生物反应器养殖法

光生物反应器提供较稳定的生长环境初步养殖两种微藻至一定生物质量。反应器是与外界隔绝的系统，能有效隔绝外界的影响。每支反应器中装置三支发光二极管提供集中、指定及稳定光谱和光强度，而雨生红球藻的光生物反应器中在进行胁迫时换成三支蓝光发光二极管。气氛亦用于代替太阳光及从大气中溶入空气。



4 绿色建筑、循环经济及转废为宝

1. 配合桑田及过滤走廊围绕城市而生的农业景观设计，减少建筑物碳排放。
2. 水中污染物的浓度因应微藻的消耗而降低，得以改善的水质输出于过滤走廊作循环使用。
3. 微藻的生物质量，经过萃取后可用于制造肥料、鱼粮、提炼生物柴油及生产虾青素等具经济价值用途。



3 微藻养殖 开放式池塘养殖法

当两种微藻被养殖至一定生物质量，将分别投入开放式池塘进行长时间及大规模养殖。池塘是与外界无隔绝及开放的系统，最大优势为低运营成本。池塘会以太阳光作光源及从大气中溶入空气。太阳光免费成本，同时具体多种光谱及能达高光强度。

微藻·生态循环·转废为宝



藻塘 Algae Ponds

藻塘项目团队



香港公开大学
THE OPEN UNIVERSITY
OF HONG KONG

香港公开大学

何建宗教授，香港公开大学科技学院院长

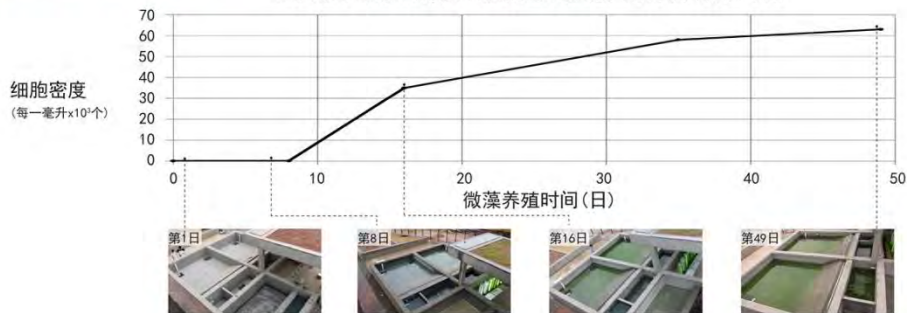
黄仪强先生，香港公开大学科技学院助理讲师

陈嘉坤，陈俊杰，张嘉佑，何庭康，

李耀麟，谢俊耀，姚莒葵

微藻生长图

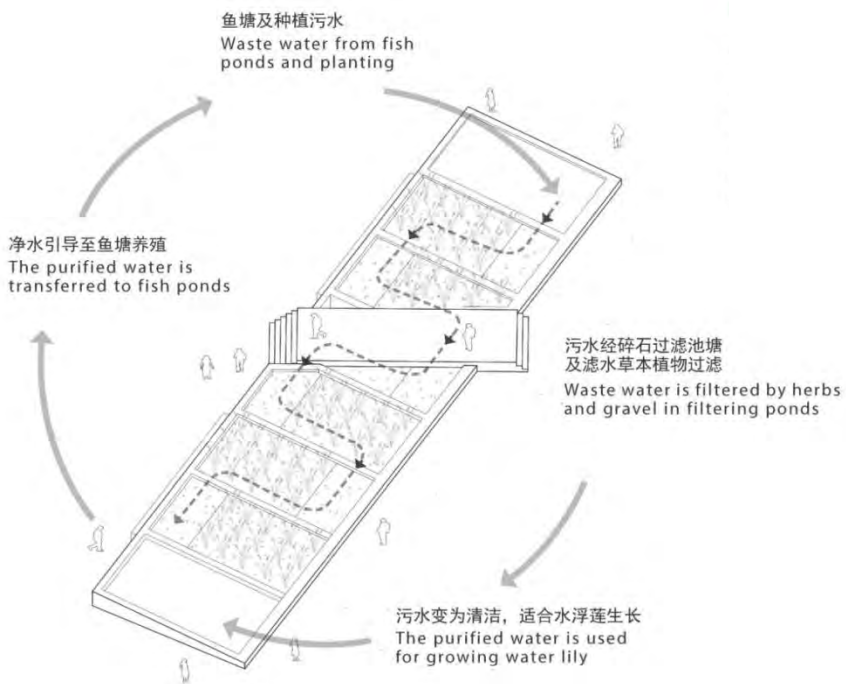
蛋白核小球藻(开放式池塘养殖)细胞密度变化相对养殖时间



8



过滤池塘 Filtering Ponds

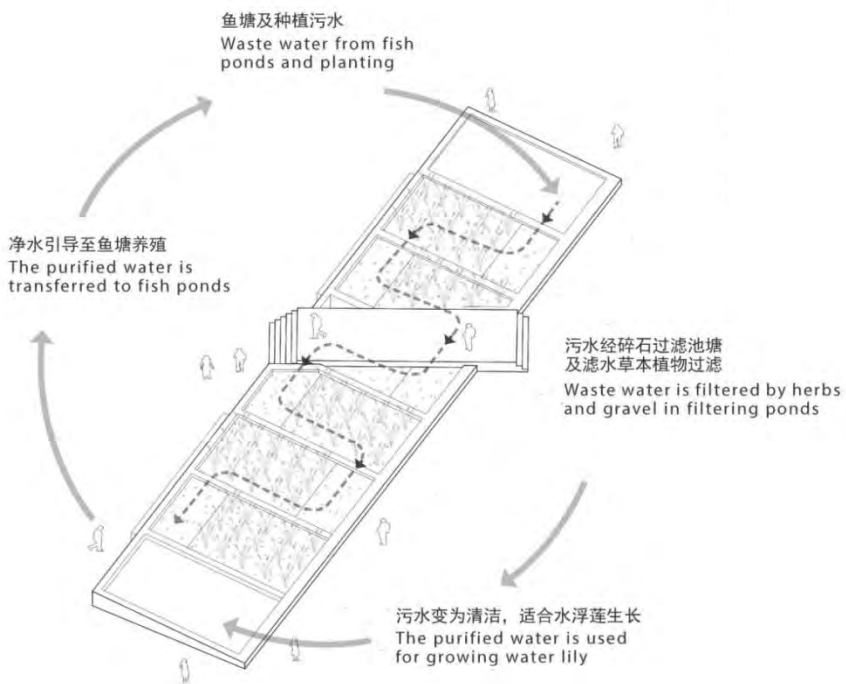


过滤池塘 提高水资源利用效率, 污水循环处理. 滤水草本植物及碎石栽培介质为过滤媒介, 处理项目中的废水

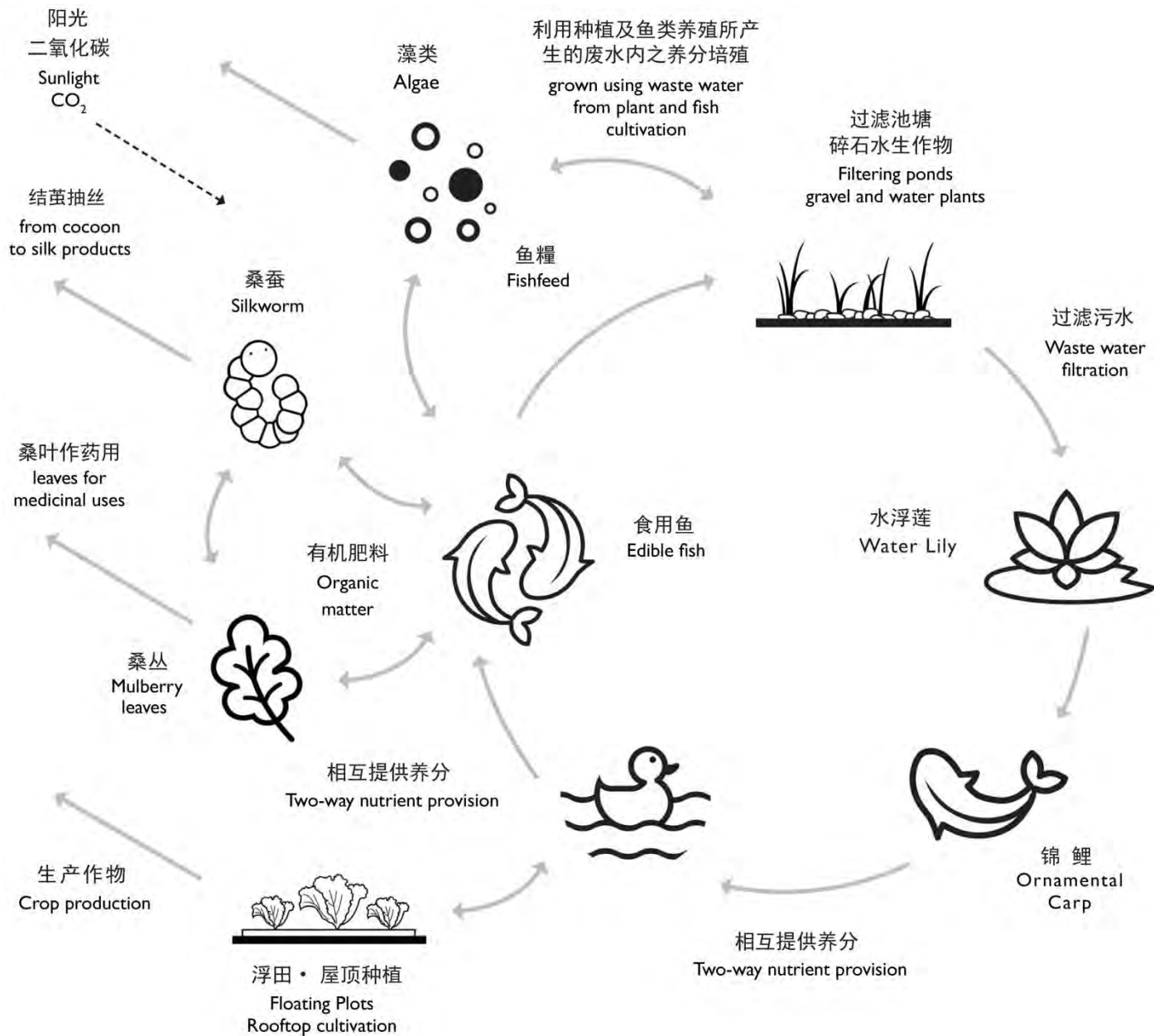
8



过滤池塘 Filtering Ponds



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Multi-cycle Ecology

Floating Fields integrates multiple ecological cycles, including Mulberry dyke Fish pond, aquaponics, floating farming plots, rooftop growing, filtering ponds and algae cultivation into one interrelated productive ecosystem. Ecologies within each part have multiple functions such as two-way nutrient provision, waste water recycling, crop production and landscape features, creating more flexibility than conventional closed systems; a virtuous cycle

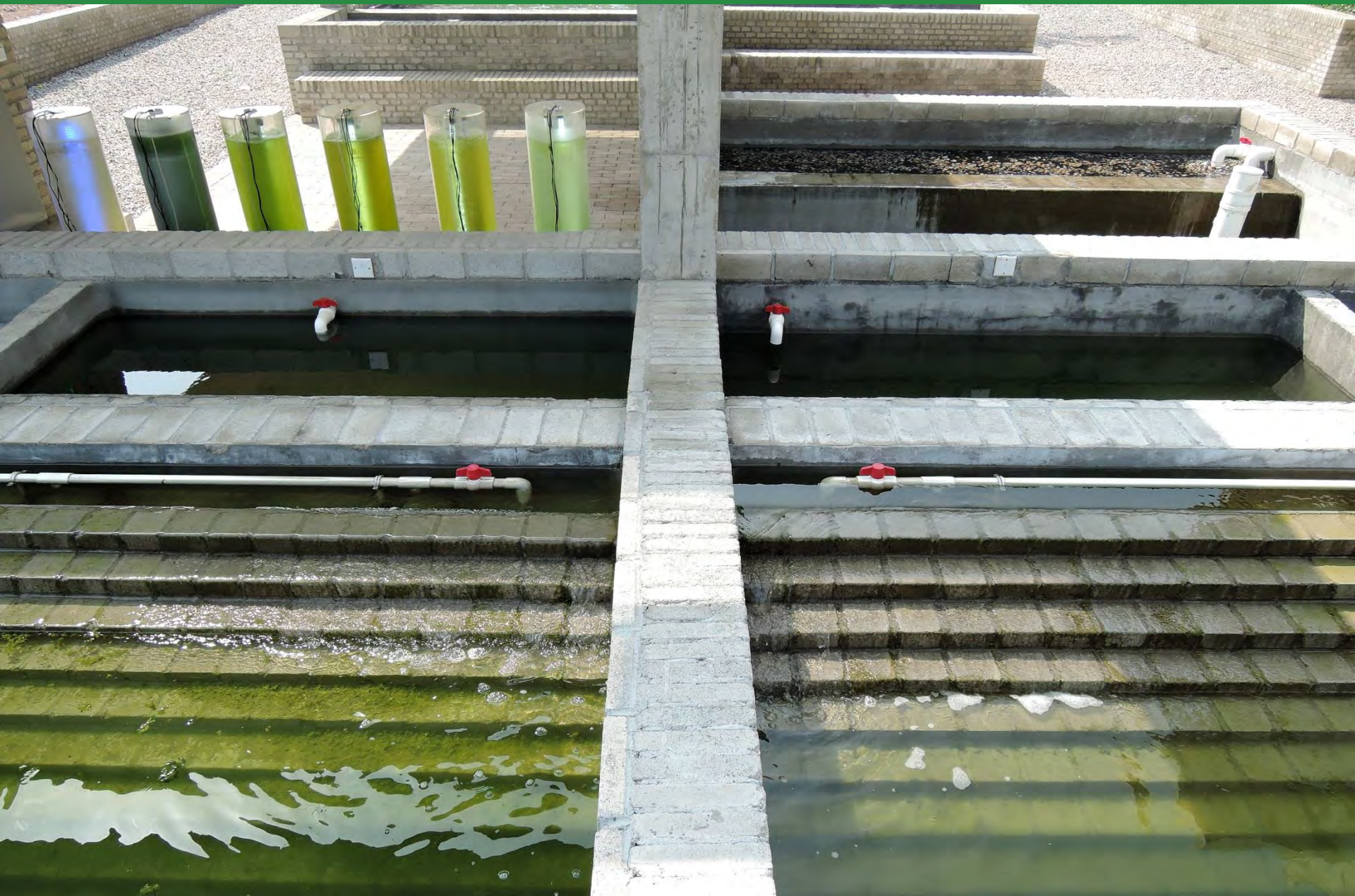
Floating Fields

蛇口浮田



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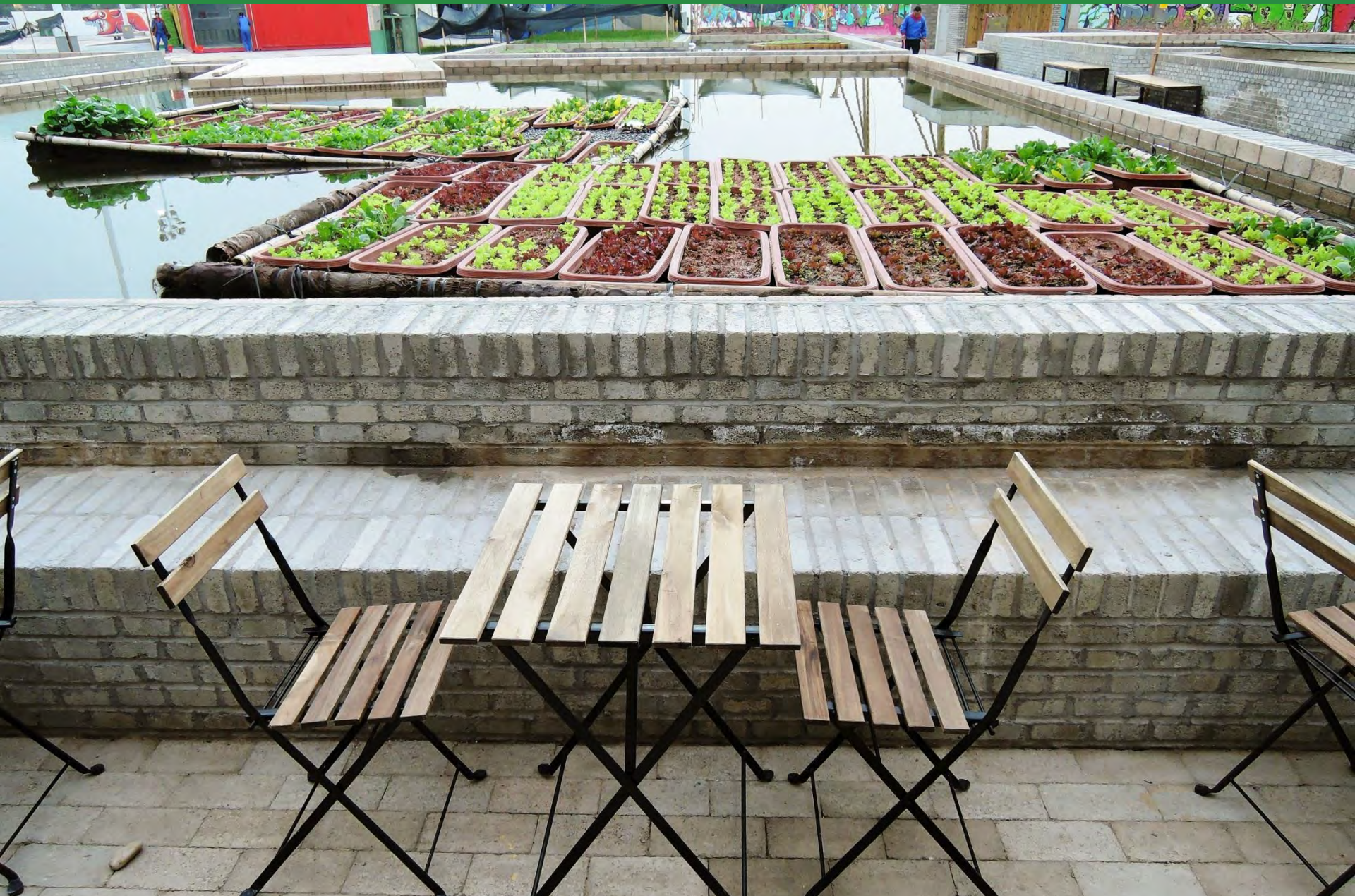
Floating Fields

蛇口浮田



Floating Fields

蛇口浮田



Floating Fields

蛇口浮田



Floating Fields

蛇口浮田



4. PUBLIC ENGAGEMENT AND RECOGNITION

Floating Fields 蛇口浮田



Floating Fields 蛇口浮田



Floating Fields

蛇口浮田



Floating Fields

蛇口浮田



Floating Fields

蛇口浮田

6th UABB Biennale Organizing Committee Grand Prize

Award Jury comments:

“Floating Fields is a landscape complex that constitutes an experiment and exploration entirely based on the curatorial theme of “Reliving”. It is an exquisite and beautiful work, not only reviving the roots of a variety of agricultural and aquatic cultivation, the unique ecological agricultural landscape of the Pearl River Delta, but also extends and transforms them into a unique public space that offers a pleasurable leisure experience. Floating fields recreate the ‘mulberry-dyke fish-pond’ culture in an elegant and lyrical way.”



Floating Fields

蛇口浮田

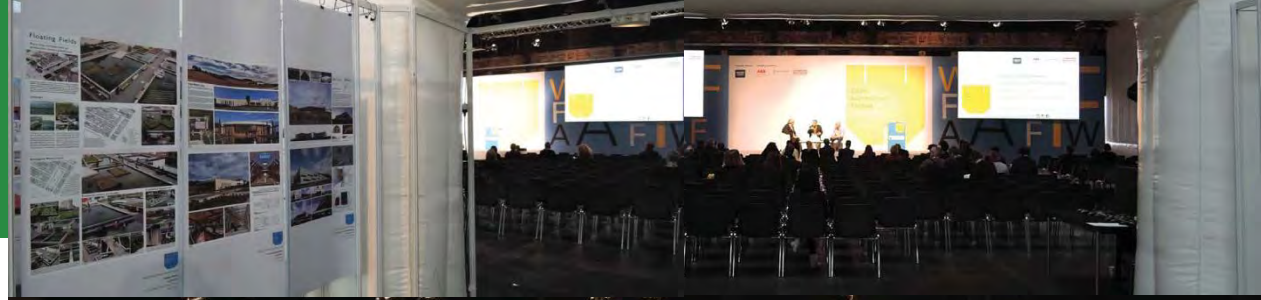
WORLD ARCHITECTURE FESTIVAL 2016 Berlin

Winner

Production, Energy and
Recycling – Completed
Buildings category

Super Jury

David Chipperfield (David
Chipperfield Architects), Louisa
Hutton (Sauerbruch Hutton),
Frédéric Migayrou (The Bartlett)
and Angelene Chan (DP Architects).



Architectural, academic publications, exhibition & mass media coverage



- "Il riscatto della natura". **ACER Revista ACER** no.6 vol.32, pp.35-40. Milan, Italy: Il Verde Editoriale (2016-11)
- "Cultivating Ground in a Post-Urban Future" **Evergreen - Living with Plants** ed. by Ehmman, Klanten, and Pease. pp.178-183. Berlin, Germany: Die Gestalten Verlag GmbH & Co. KG (2016-09)
- "Cultures hongkongaises". **L'Architecture d'aujourd'hui**. no.412, pp.30-31. Paris, France.
- [蛇口大成·浮城桑田] **Urban Environment Design (UED)**, vol.101 no.06, pp.376-379.



- "Edible public space: from food production to leisure eco-pondscape". **Futurarc - Green Architecture Asia**. vol.49 pp.56-59.
- "Giardini Flottanti" **Topscape Paysage** Vol.25, pp.128 –133, Milan.
- "Floating Fields" in **Post-industrial Urban Orchard: City after the City** curated by NICOLIN Pierluigi and SANCHIS García Maite. **Triennale International Exhibition 2016 (Milan)** vol.21. Milan, Italy.

5. CONTINUITY AND EXTENSION

Supervised Thesis Research: *Algaemy Factory: Salutogenic Ecology in Yuen Long, Sophia AU, 2014-15*



Algaemy Factory is a response to the 'Aesthetics' competition by Kohn Pedersen Fox Associates. The project is a multi-level, multi-use development in Yuen Long, Hong Kong, designed to produce salutogenic ecology in a post-carbon city.

The project is based on the 'Redundant Capacity' of the site, which is a former industrial site with a high level of redundancy. The design is based on the 'Redundant Capacity' of the site, which is a former industrial site with a high level of redundancy. The design is based on the 'Redundant Capacity' of the site, which is a former industrial site with a high level of redundancy.

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'Best of Category - Students Architecture' in A&D Trophy Awards 2015



Earth Day Summit 2016: From Paris Agreement to Post-Carbon Cities

Earth Day Summit 2016 From Paris Agreement to Post-Carbon Cities

The Open University of Hong Kong



Presentation, panel discussion and exhibition



Presentation to Mr Kam-sing Wong, Secretary for Environment



“瓜菜造園 凝聚社區 我們值得擁有食物公園”

Food Park in Hong Kong?

- Urban cultivation
- Parks & Public Space
- Community Building
- Liveability

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02

01 Big Story

在這城， 拉得安心有多難？

- 02 好自然 瓜菜造園 凝聚社區 我們值得擁有食物公園
- 03 創業：Start Me Up 永不言休 健康媽媽闖天然零食市場
- 04 小都會大世界 徘徊在光與暗之間——果欄人
- 05 Checklist 中環建十分一籃球場大釣魚區 大海變魚缸

03

04

05

其享主意
自耕自煮
茶餐廳變社區廚房
充權教室
石硤尾教主
什麼要玩的
街坊都建出來
社區影像
另一類中環居民：
在你身旁的那些孺子
職人：我的一天
西裝設計師
塑造男士形象

承印人：東萊印務有限公司 地址：香港觀塘大坑工業大廈11座15樓



18



19

凝聚社區 善用閒置資源

康文署的「社區園圃計劃」體現一分耕耘，一分收穫，居民以私產的態度打理自己租用的園圃，當中「社區」的成分卻微乎其微；而「社區公園」則體現「公共性」，這構想會得到支持嗎？

有份參與天水圍實驗試種計劃的街坊寶珠和 Flora，二人分享當初在天橋底下種菜的喜悅。「我們會開會分配工作時間表，初時因為泥土太乾，每人負責每天過去澆水兩次。」Flora 是主婦，寶珠是退休婦女，二人都不懂種菜，笑言只靠到處求教。「當初連堆肥也不會，但街坊看見一幅天橋下的爛地有機會種出食物，都樂見其成，後來有人把養雞的水給我們灌溉，又有人把豆渣送給我們作肥料，泥土漸漸肥沃起來。」正當泥土漸見肥沃之時，他們被康文署要求清理所有「擺放物」，7個月來用心養護的泥土再度寬瘠。現時，他們正向元朗地政處申

請另一幅閒置廢地作為社區菜園，位置在一所學校與一道明渠之間，面積不大，政府一直以鐵絲網圍起，沒有任何用途。可惜申請了一年多，該地政處一直拖延，讓街坊無了期等待。

寶珠和 Flora 都沒有參加「社區園圃計劃」，她們表示：「其實我們很忙的，平日要照顧家庭，空餘的時間都不多！」當初參與天橋下種植，主要是認同「善用政府空置用地」的理念，視之為一個街坊聚會的時間。她們說農作物收成不是最大收穫，「那時候，每次收成只夠煮一餐，大家每人分一口就當嘗過了。最主要是大家見面，一起分工合作，每次開會聊得興起，幾乎都忘了開會的內容。」

人的元素才是一個地方發揮作用的主角，鍾教授以「make it alive」去形容人與地方的關係。他今年以「蛇口浮田」再參展，獲得「深港城市建築雙城年展」的組委會大獎，而新作品的設計亦注重人文元素。在這項



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目中，小孩可坐在水池邊玩，橋上沒有圍欄，魚菜共生的水池上可以划小艇。他先後兩次參展，項目都與食物有關，被問到「怎樣的食物公園才算失敗？」他回答：「吸引不到人去參與就是失敗了。」雖然雙年展已閉幕，但他的「蛇口浮田」繼續運作，在深圳蛇口延展一年。



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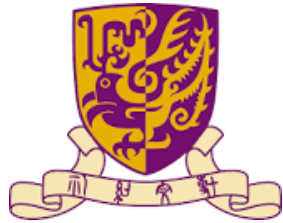


在嘉道理農場的生機園裏，種有香草番茜 (parsley)，小孩指着形態像迷你樹木、但散發清香氣味的植物問身旁的母親：「這是什麼？」

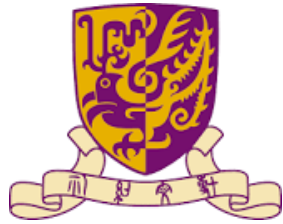
「噢，這個……是西蘭花。」

不知不覺間，食物的原野距離我們太遠，以致食物與植物的關係被分隔開來。既然「食物」和「公園」兩者都是生活中的基本，應可理所當然地融為一體，相比樹木，農作物的成長變化誇張，當親眼看到豆角掛滿在棚架上，吃剩的菠蘿頭再次結出新菠蘿，翠玉瓜頂部長出漂亮的黃花，悅目的生長過程更加令人期盼和驚喜。活生生的實例陳列眼前，正是讓人重新認識食物的最好方法。

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Floating Fields 蛇口浮田



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