

Opening Ceremony of 2010/2011 Hong Chi – Hong Kong Jockey Club
Community Organic Farming Competition
for Primary & Secondary Schools in Hong Kong
2010/2011 匡智香港賽馬會全港中小學社區有機農耕比賽開幕禮
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Green Roof + Urban Farming

綠化屋頂 + 都市農耕



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Introduction 前言

- Problems in urban cities 城市面對的問題
 - Urban heat island 熱島效應
 - Lack of greenery space 缺乏綠化空間
 - Large ecological footprint 大型生態足跡
- Green roofs can help to mitigate the adverse effects 綠化屋頂可以幫助減輕不利影響
 - Bring the nature back 把大自然帶回來
 - Make better use of roof space 更好地利用屋頂空間



Examples of green roofs in Hong Kong 香港屋頂綠化的例子



HK Wetland Park 濕地公園



EMSD Headquarters 機電署總部



Parklane, TST 尖沙咀柏麗大道



A school in San Po Kwong
新蒲光某小學

(Photos taken by Dr Sam C M Hui)

Examples of green roofs in the world 國際屋頂綠化的例子



Solar Campus Jülich, Germany (11 Jul 2001)



IBN-DLO Wageningen, the Netherlands (2 Jul 2001)



Putrajaya Int. Conven. Centre, Malaysia (30 Jun 2006)



Beitou Taipei Library, Taiwan (6 Aug 2007)

(Photos taken by Dr Sam C M Hui)



Green roofs 綠化屋頂

- Major types 主要類型 (see Table 1)

- Extensive 粗放型
- Semi-intensive 半密集型
- Intensive 密集型

- Roof gardens 天台花園:

- Usually intensive greening with other features such as potted plants, pond, etc. 通常為密集型 + 其他特徵
- Sky gardens 高空花園 (e.g. > 15 storeys high)



Table 1. Major types of green roofs and their characteristics

表1：主要類型的屋頂綠化及其特點

Characteristics	Extensive 粗放型	Semi-intensive	Intensive 密集型
Depth of material	150 mm or less	Above and below 150 mm	More than 150 mm
Accessibility	Often inaccessible	May be partially accessible	Usually accessible
Fully saturated weight	Low (70-170 kg/m ²)	Varies (170-290 kg/m ²)	High (290-970 kg/m ²)
Plant diversity	Low	Greater	Greatest
Plant communities	Moss-sedum-herbs and grasses	Grass-herbs and shrubs	Lawn or perennials, shrubs and trees
Use	Ecological protection layer	Designed green roof	Park like garden
Cost	Low	Varies	Highest
Maintenance	Minimal	Varies	Highest

Table 2. Public and private benefits of green roof systems

表2：綠化屋頂系統的公共好處和私人好處

Public benefits: 公共好處	Private benefits: 私人好處
<ul style="list-style-type: none">- Aesthetic value- Mitigate urban heat island- Stormwater retention- Create natural habitat- Functional open space- Agricultural space- Filter dust and pollutants- Filter rainwater	<ul style="list-style-type: none">- Increase roof life span- Reduce cooling loads- Contribute to green building rating credit points- Better use of space- Reduce noise levels- Reduce risk of glare for surrounding buildings



Green roofs 綠化屋頂

- Other benefits 綠化屋頂的其他好處
 - Urban farming 都市耕種 (e.g. growing vegetables)
 - Make best use of roof space; may be organic
 - Education 教育
 - Integrated with school curriculum
 - Community and social functions 社區活動
 - Exercises & hobbies for children, adults & elderly
 - Horticultural therapy 園藝療法
 - Sensory, meditation effects; manage emotion/stress



Urban farming & education
都市耕種及教育



Horticultural therapy &
social functions
園藝療法和社區活動

Urban farming 都市農耕



- Also called “Urban Agriculture” 都市農業
- Definition: 定義
 - Agricultural activities that help enhance the value and quality of life in terms of economic, socio-cultural aspects by growing plants and animals using various spaces in urban areas
 - 在城市地區利用各種空間，通過種植植物和動物，就經濟、社會和文化方面來幫助提高價值和生活質量的農業活動

Green roofs and urban farming in Osaka, Japan (Namba Parks) (2003)

日本大版南波中心的屋頂綠化及都市耕種



(Source: www.treehugger.com & www.toho-leo.co.jp)

Rooftop urban farming in the world 世界上的屋頂都市耕種



Bangkok, Thailand 泰國曼谷



Tokyo, Japan 日本東京



London, UK (with bee keeping) 英國倫敦(含養蜂)



San Francisco, USA 美國舊金山

(Source: www.time.com)

Urban farming 都市農耕



- Benefits of **urban farming**: 都市農耕的好處
 - Enhance urban landscape and environment
提升城市景觀和環境
 - Produce fresh local or organic food
生產新鮮或有機的本地食品
 - Reduce ecological footprint 減少生態足跡
 - Enable community & social functions
使社區及社會功能
 - Create farming & associated jobs
創造農業及相關工作

Urban farming 都市農耕

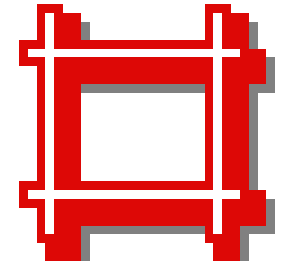


- **More people participate** in urban farming
更多的人參與都市農耕
 - They become more aware of the importance of the earth, nature, the environment, life and health and the value of working together 他們變得更加了解地球的重要性、自然、環境、生命和健康、一起工作的價值
 - This leads to healthy cities and communities for sustainable development 這導致健康城市和社區的可持續發展

Table 3. SWOT analysis of rooftop urban farming in Hong Kong
 表3：香港屋頂都市耕種的SWOT分析

<p>Strengths 優勢</p>	<ul style="list-style-type: none"> -Fresh food, safe & reduce transportation -Provide many environmental & social benefits -Better use of roof spaces (many functions possible)
<p>Weaknesses 弱點</p>	<ul style="list-style-type: none"> -Lack of roof spaces for farming -Recognition of agriculture as decaying industry -Lack of research & development for urban farming
<p>Opportunities 機會</p>	<ul style="list-style-type: none"> -Growing demand for safe & organic foods -Advantages of community & leisure farming -Need to manage/rehab many old buildings
<p>Threats 威脅</p>	<ul style="list-style-type: none"> -Lack of information and opportunity -Lack of research data related to urban farming -Typhoon attack & air pollution

Design guidance 設計指導

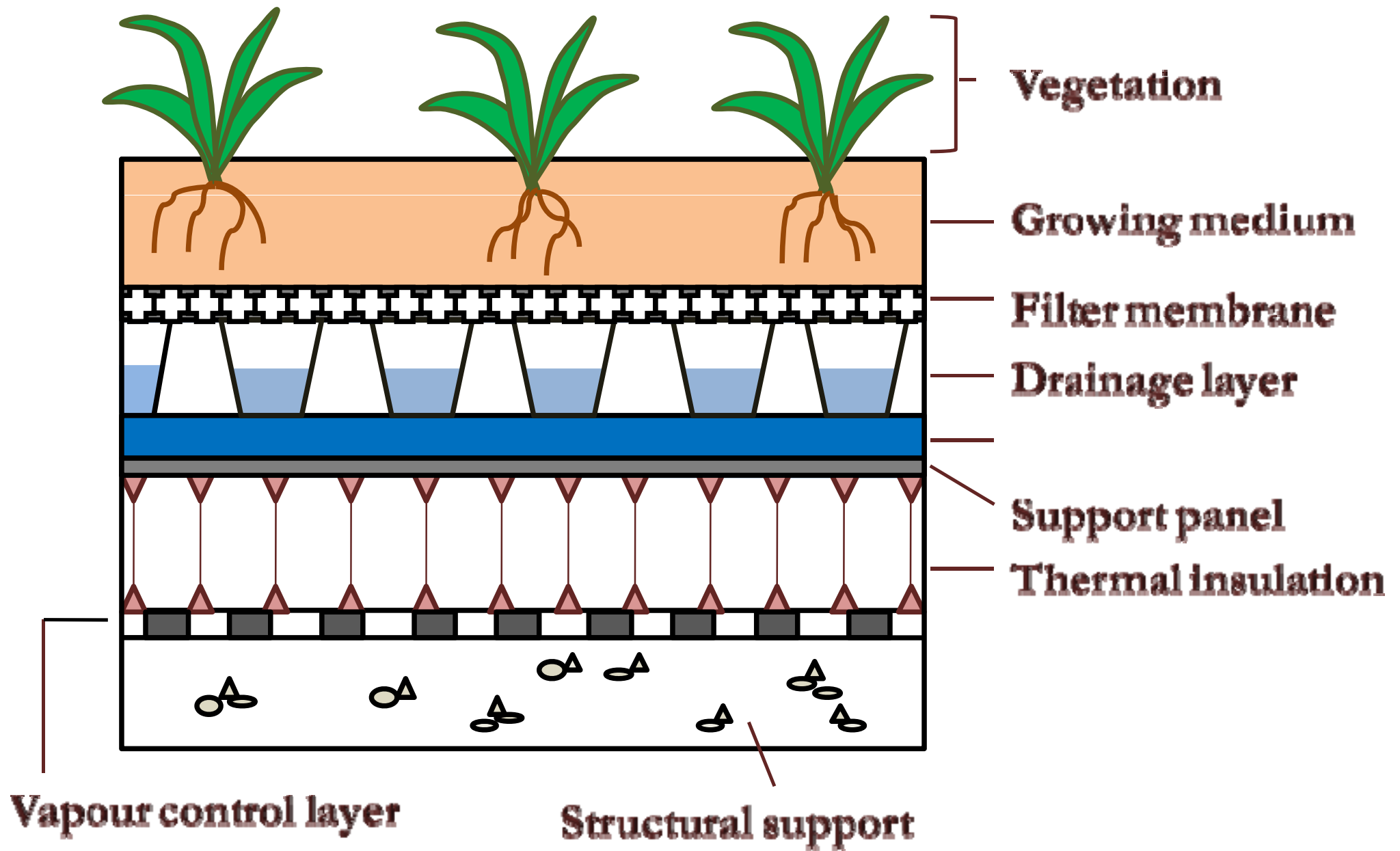


- Key factors for planning 主要規劃因素
 - Structural loading 結構負荷
 - Accessibility 能否容易到達
 - Waterproofing 屋面防漏水
 - Drainage 排水渠務
 - Maintenance 維護保養
- Other design considerations 其他設計考慮
 - Selection of plants 選擇植物
 - Stakeholders' involvement & support 參與支持



Typical structure of extensive green roof

綠色屋頂的典型結構

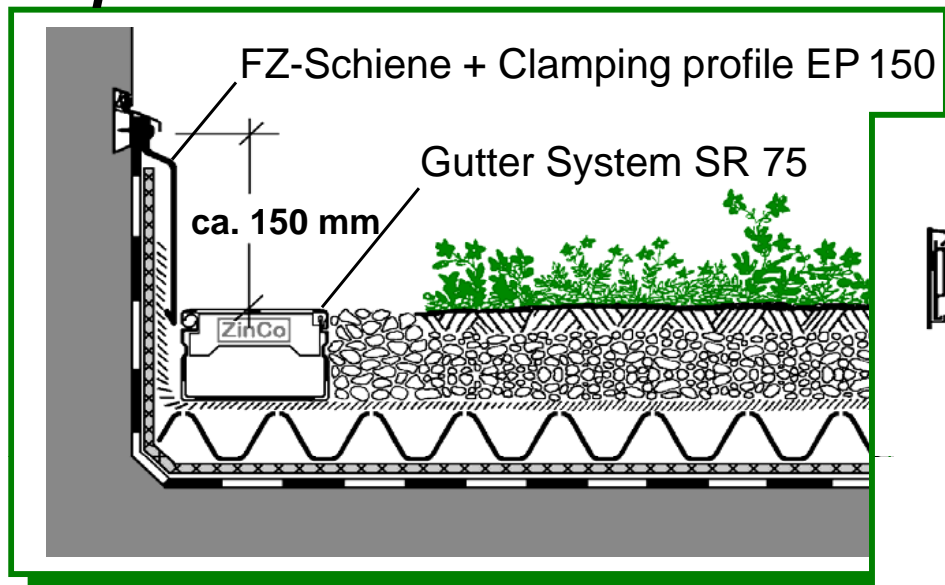


Green roof on concrete structure 屋頂綠化在混凝土結構上

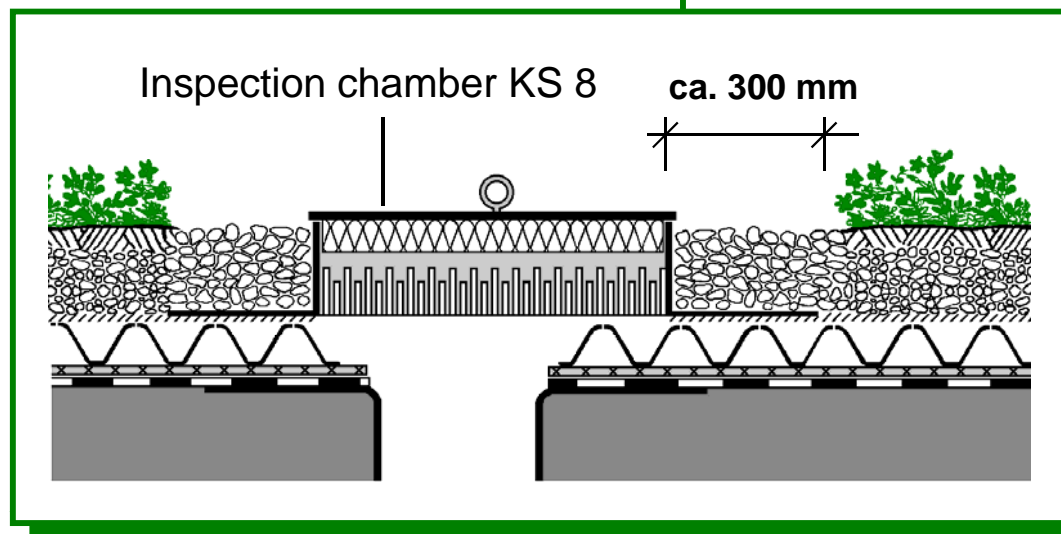
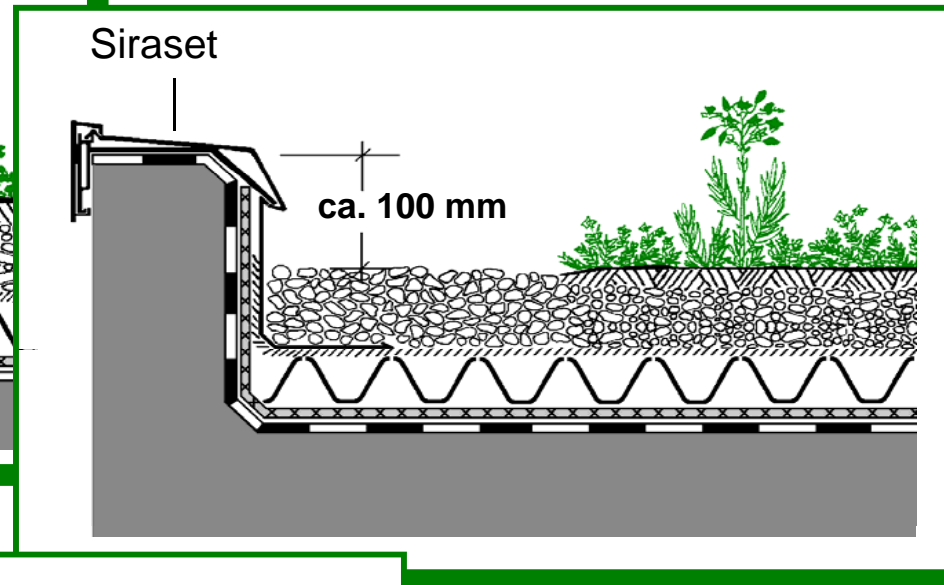


Examples of green roof details 詳細屋頂綠化的例子

Upstands

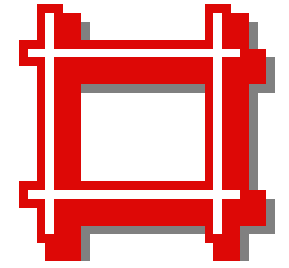


Roof Perimeters



Roof outlet with inspection chamber

Design guidance 設計指導



- Education functions 教育功能
 - Environmental 環保
 - Improve environmental awareness 加強環保意識
 - Learning from planting 讓學生從栽種體驗中學習
 - Scientific 科技
 - Enhance science education 加強科學教育
 - Liberal study 公民
 - Facilitate community involvement 促進社區參與
 - Horticulture 園藝
 - Allow natural functions 親近大自然活動



Environmental
citizenship

Sustainable
development

政策 統籌 課程 活動

綠色學校

行為 環境 資源 培訓

環保公民

意識 態度 行動

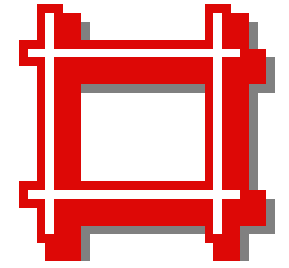
可持續發展

經濟 社會 環境

Green school



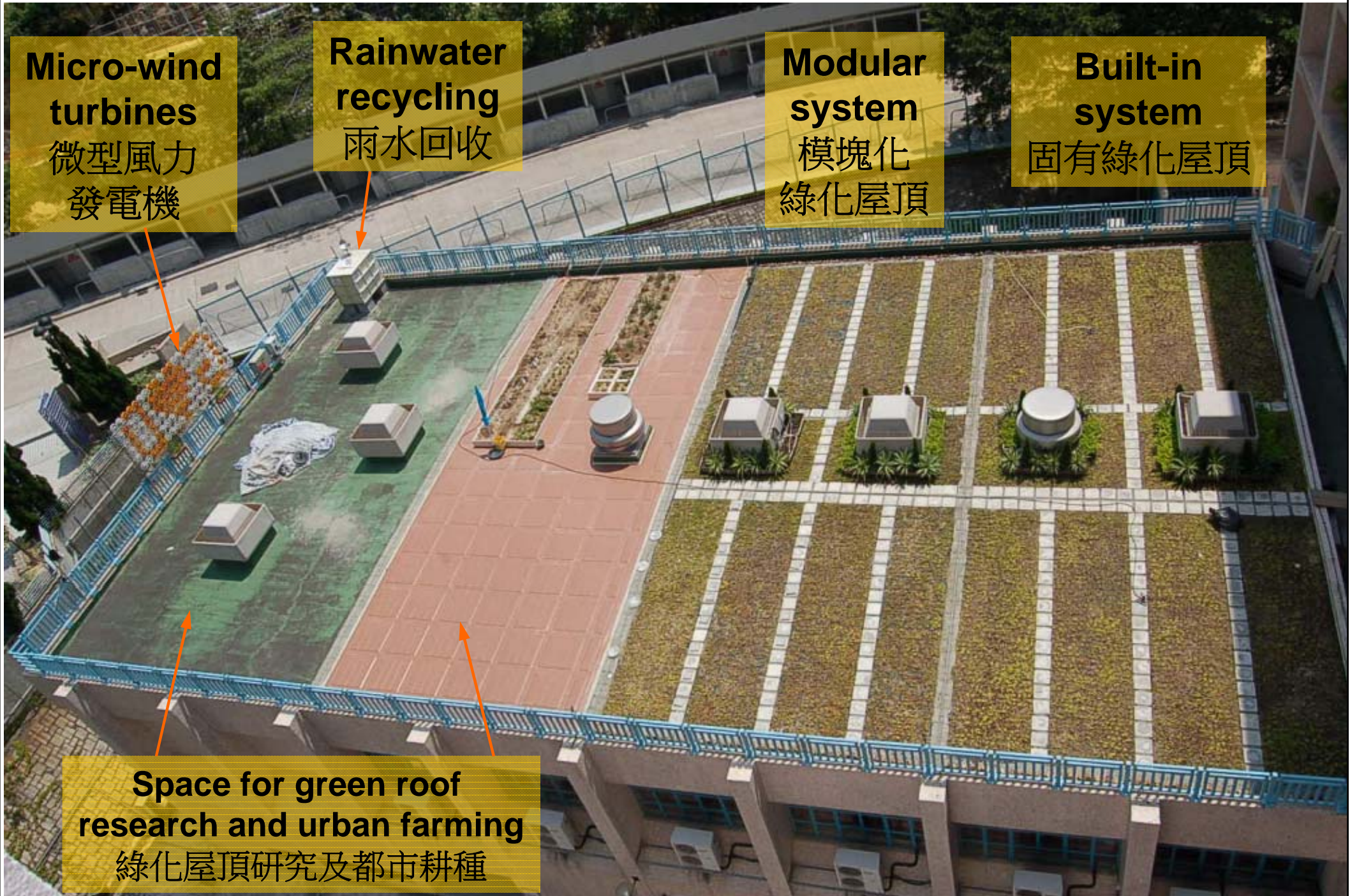
Design guidance 設計指導



- Possible learning topics 可學習的題材
 - Biodiversity 生物多樣性
 - Building & roof construction 建築及屋面施工
 - Energy conservation 節約能源
 - Gardening & horticulture 園藝
 - Natural habitat 自然棲息地
 - Thermal insulation 熱能絕緣
 - Urban heat island 城市熱島
 - Water conservation 水源節約



A green roof project with integrated systems 綠色屋頂項目的綜合系統



Urban farming on green roofs 綠化屋頂都市農耕



Farming on the roof



Vegetables and herbal plants

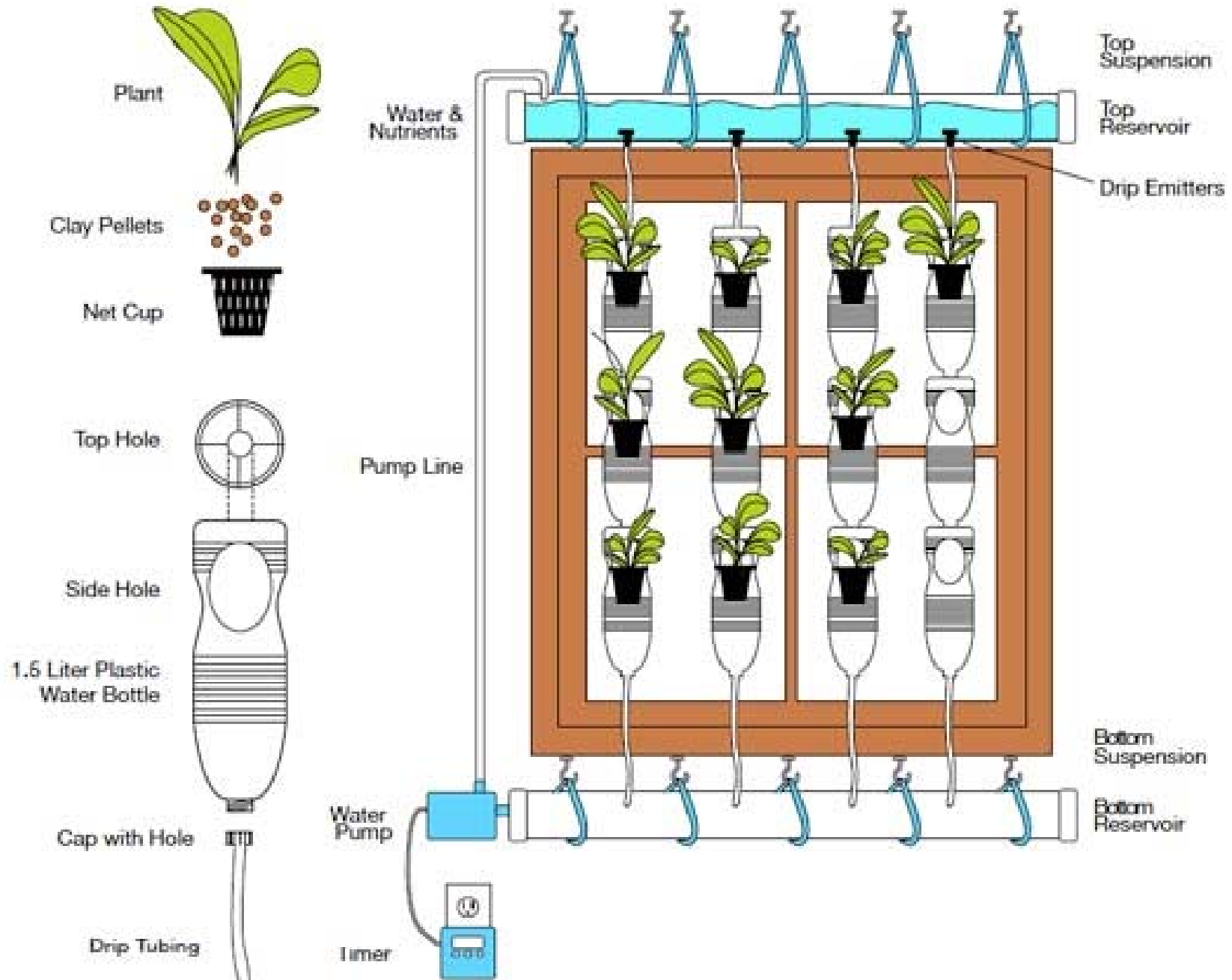


Water melon



Green beans

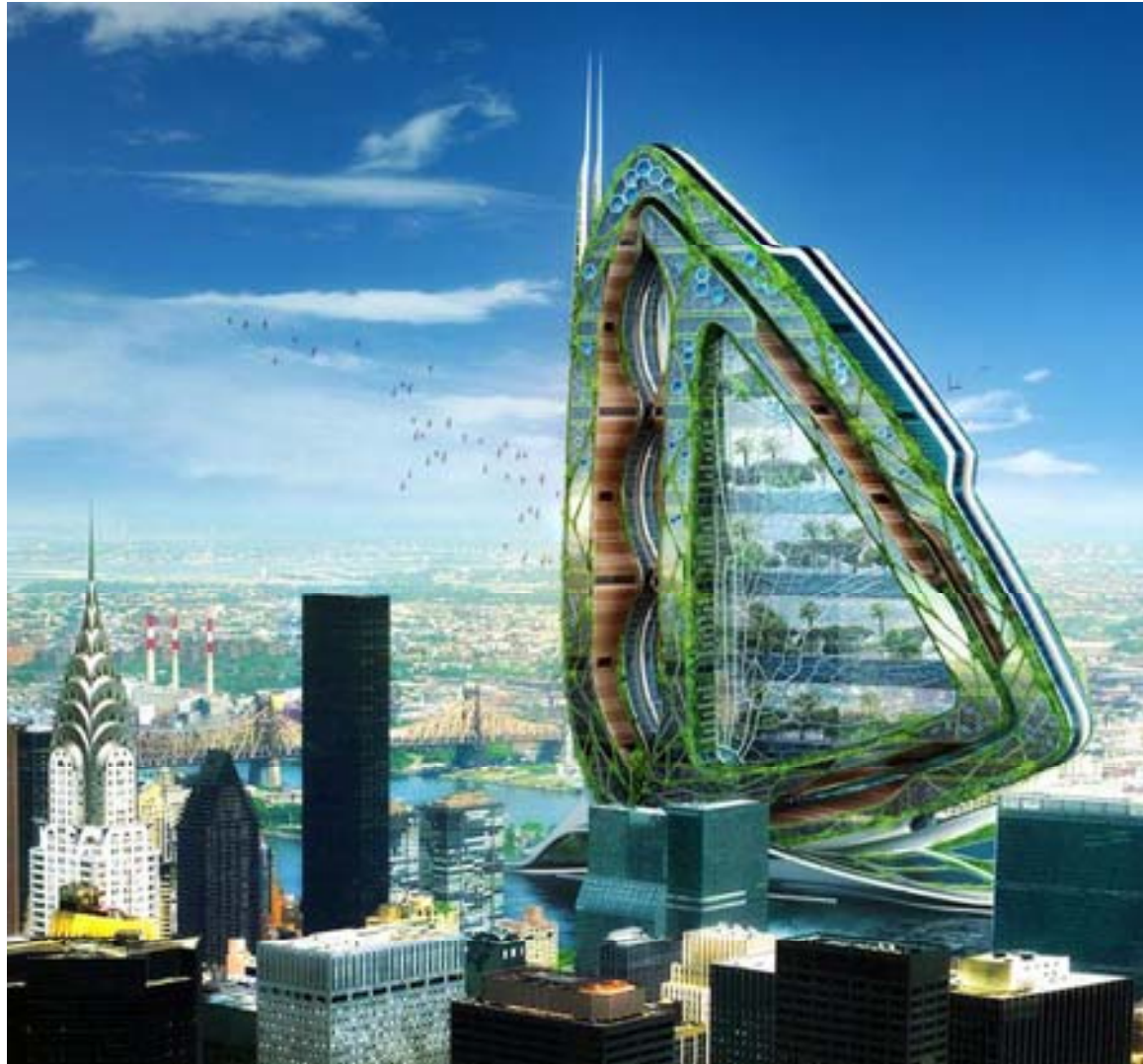
Window Farms Technique 窗口農耕技術



Vertical Farm and
Building
Integrated
Agriculture
垂直農場及農耕
綜合建築



Dragonfly Vertical Farm, New York 紐約蜻蜓垂直農場



(Source: <http://vincent.callebaut.org/>)

Conclusions 總結



- Green roof urban farming can provide many environmental and social benefits 屋頂綠化
都市農耕可提供很多對環境和社會的好處
- When applied to Hong Kong, need to consider technical issues & local conditions 當用於香港時，需要考慮技術問題及當地的條件
- More efforts are needed to develop design guidelines & practical experience 需要更多的努力，制定設計準則和實際經驗

THANK YOU 謝謝 !!



(More information: www.hku.hk/bse/greenroof/)