



***Microclimate Studies***  
*for Sustainable Public Housing Development*

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## ***Outline of Presentation***

- ***Introduction***
- ***Environmental Policies***
- ***Environmental Design in Public Housing***
- ***Micro-climate Studies***
- ***Community Engagement***
- ***Conclusion***
- ***Q&A***





SCIENCE IN THE PUBLIC SERVICE



## *High-rise and High Density Development in Hong Kong*







## **HD Environmental Policy** Promotes:

- *Healthy Living*
- *Green Environment*
- *Sustainable Development*



## **HKSAR Government's Environmentally Responsible Development Policy** : -

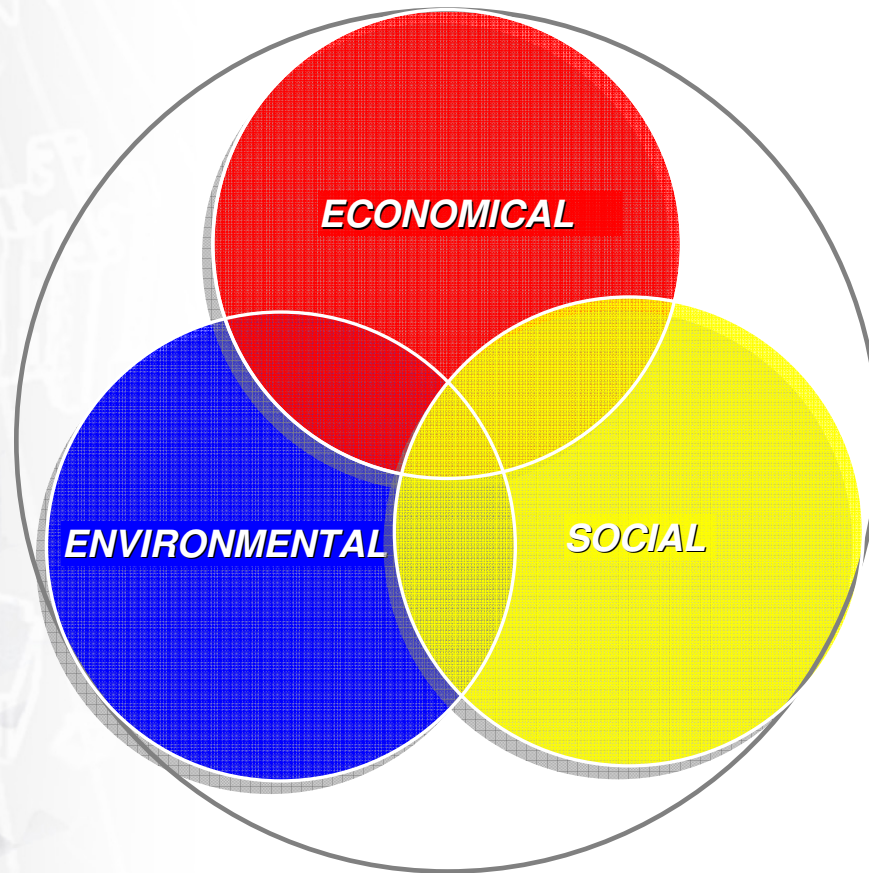
*'...to deliver a better quality of life for everyone, for now and for generations to come. We will support environmental protection and promote sustainable development....'*





## ***Sustainable Development***

*“Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”*



## ***Micro-climate***

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*'A micro-climate is the local modification of the general climate that is imposed by the special configuration of a small area. It is influenced by topography, the ground surface and plant cover, and man-made forms.'*



## *Micro-climate Studies*



*Wind Environment*



*Natural Ventilation*



*Natural Daylight*



*Solar Heat Gain*



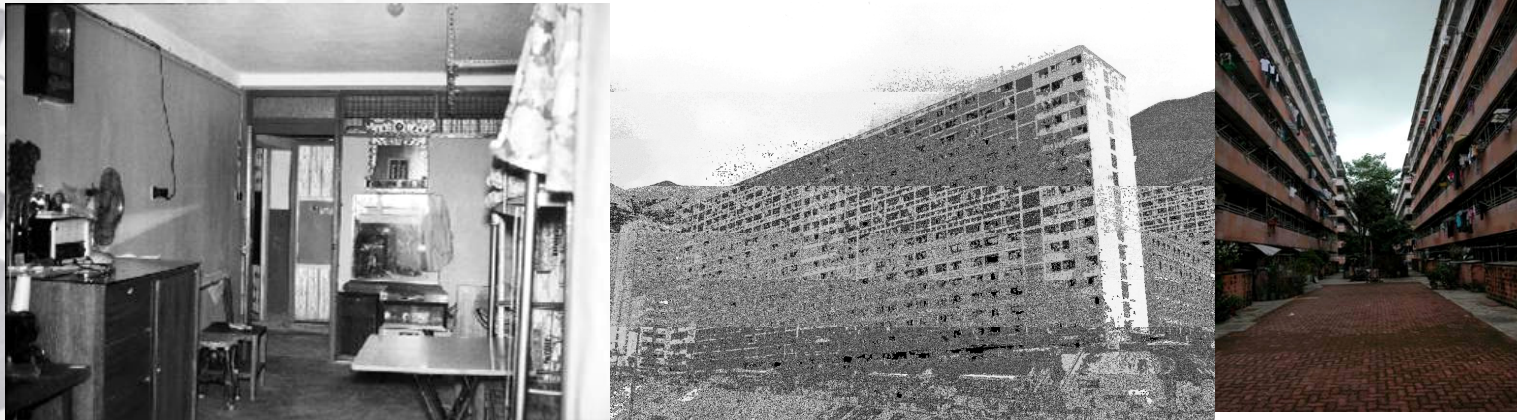
*Heat Island Effect*



*Pollution Dispersion*



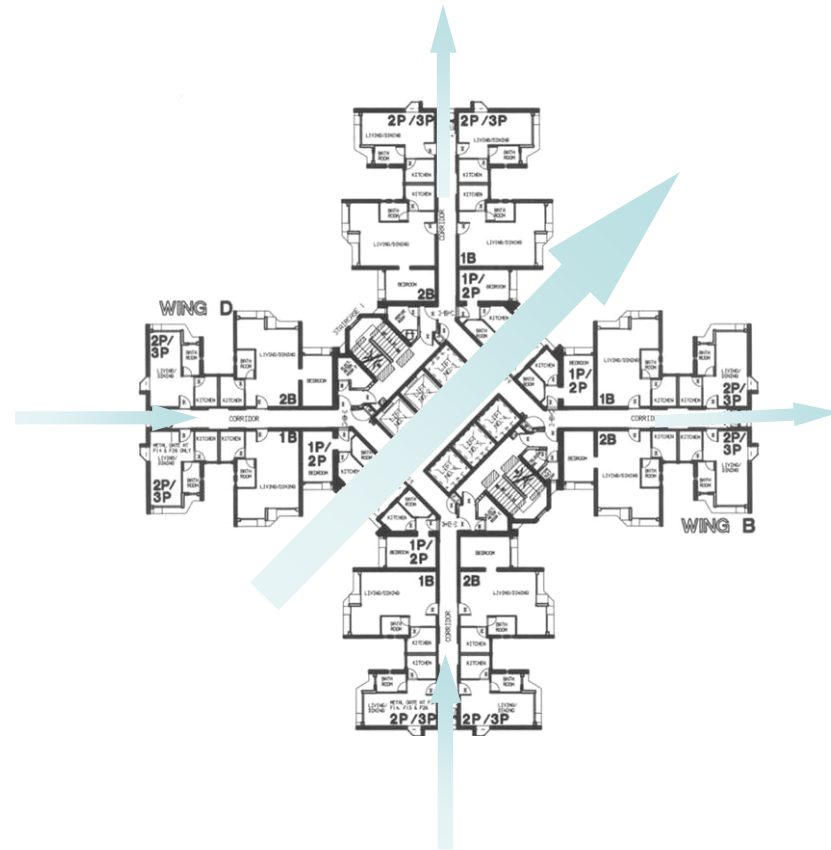
## *Ventilation in Old Public Housing Estates*



## *Solar Shading in Old Public Housing Estate*



# Ventilation and Solar Shading in Modern Public Housing Blocks



## ***Application of Micro-climate Studies***

- *In 2001, HKHA pioneered the application of Micro-climate Studies, in the planning and design process of public housing development.*
- *Starting in 2004, all new public housing projects would adopt Micro-climate Studies.*
- *Over 25 projects have now adopted the studies.*



***Purpose:***

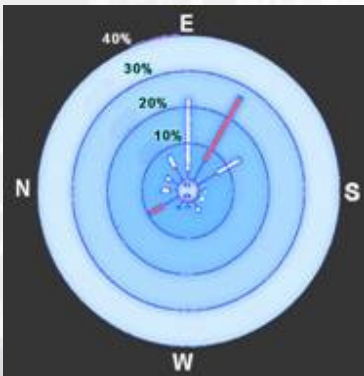
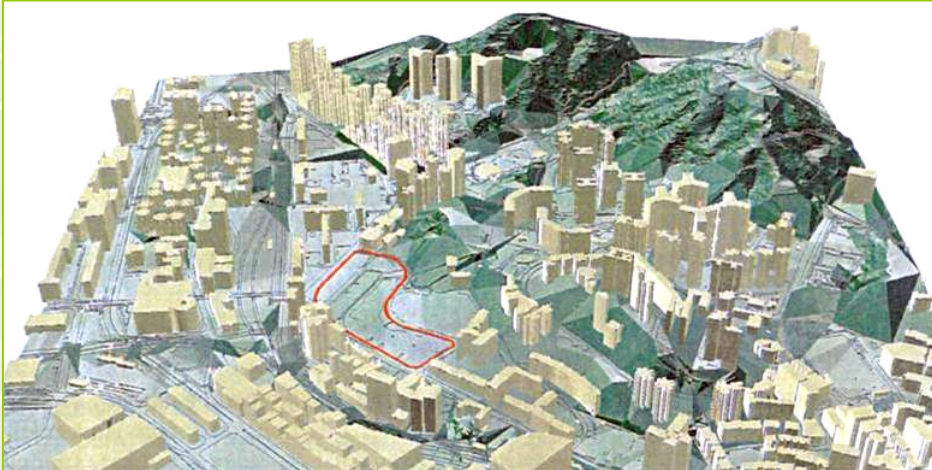
*To optimize estate planning, disposition and orientation of blocks to eliminate canyon effect, severe wind funneling effect, stagnant areas of pollution, elevated temperatures, and area of significant amplification of wind leading to deliver a quality and comfortable wind environment within the development and surrounding neighbourhood.*

***Wind Environment***

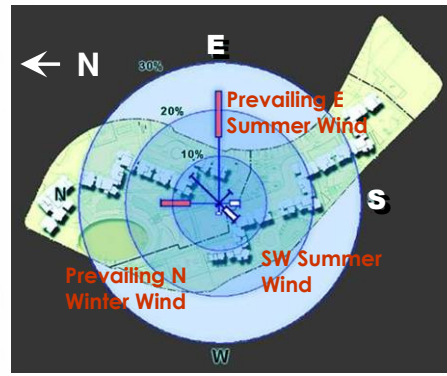
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# Site Wind Availability Data



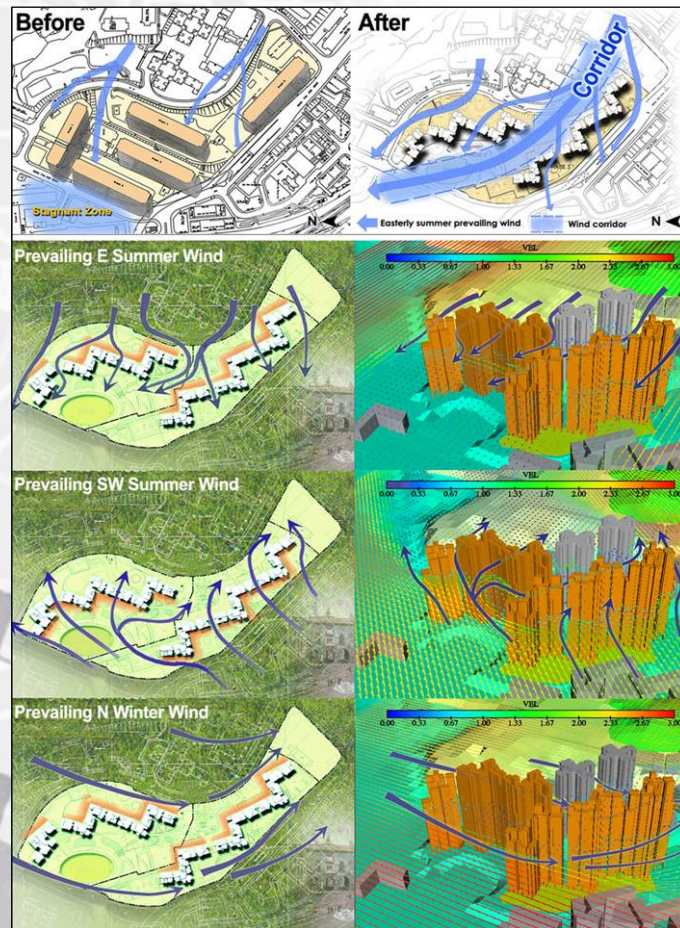
Wind Rose from nearby weather station



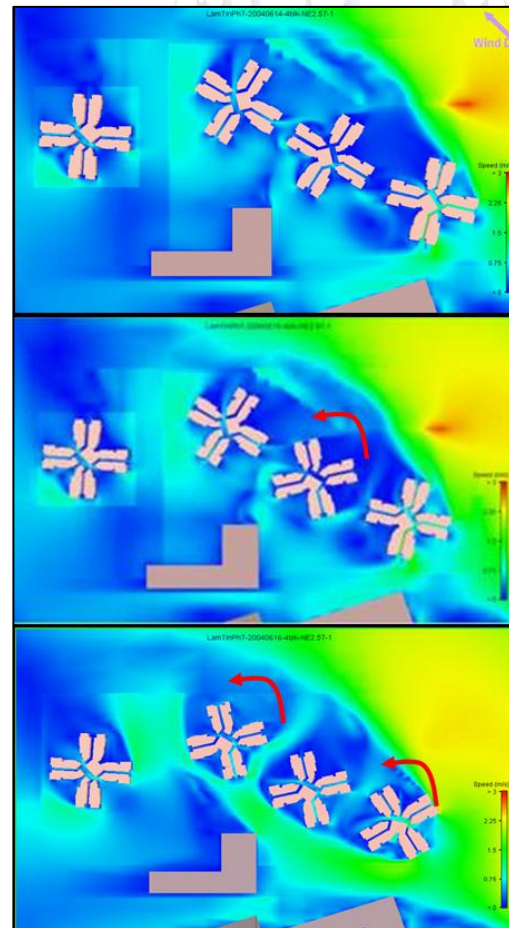
Resultant Wind Rose from Wind Tunnel Test



# Wind Environment Under Different Wind Directions and Block Orientations



Increase in air velocity with wind corridor under the prevailing East wind condition .



Different block orientations were tested for permeability to passage of wind.

## 空氣流通指引

## 屏風效應

SARS一役後，社區環保意識，市民對空氣流通的問題尤其關切。上月規劃署通過修訂有關城市設計指引，加入空氣流通指引，雖然指引沒有法律效力，但會成為城規會日後批核發展項目時的依據。

由於SARS  
流通原因，  
置業於00年  
包括通風因  
重建工程的  
產署環境評

有利微風滲透。」  
風洞加上電腦流體力學模擬程式，十分複雜，會否令設計成本暴升？負責角上設計的房屋署建築師顏嘉倩表示，關評估的費用大概只會令項目成本增加萬；但根據計算，於合適的走廊位置加戶，每座大廈每年已可節省\$4萬的電費。

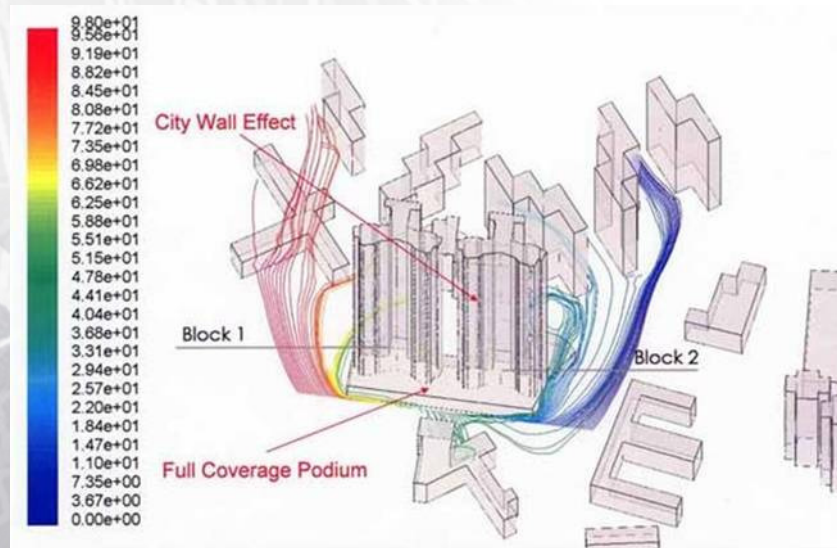
### 模擬評估 成本不變

「有了風洞及電腦模擬的結果，即可作參考，而整體建築成本亦不會增加戶向南或向北，都是劃一成本，但對新成效可以相差很大。」

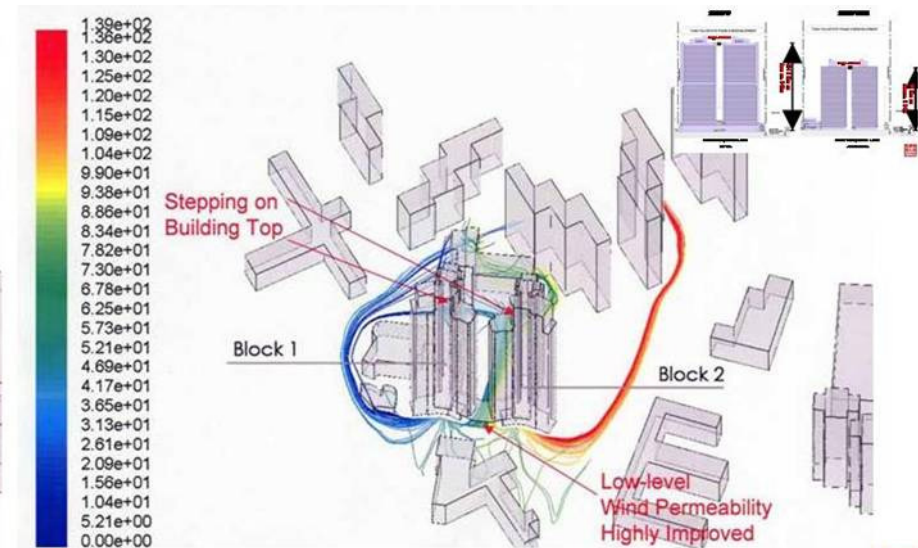
伍均宜表示，良好的通風設計，有利社區環境，亦與居民利益相關。「公民一般入息較低，老人家有冷氣也不開，良好的通風設計可令單位的通風改善，亦減少居民開冷氣的需要。」



## Comparison of Wind Permeability at Street Level



Design with podium



Design without podium

The average wind speed and velocity ratio at street level increases without podium.



***Purpose:***

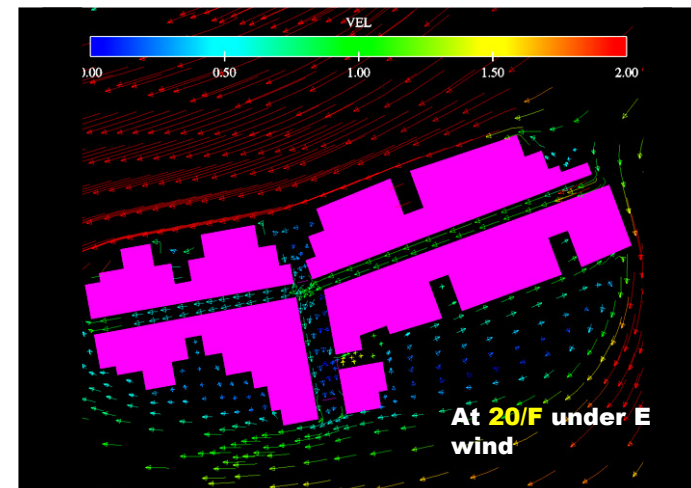
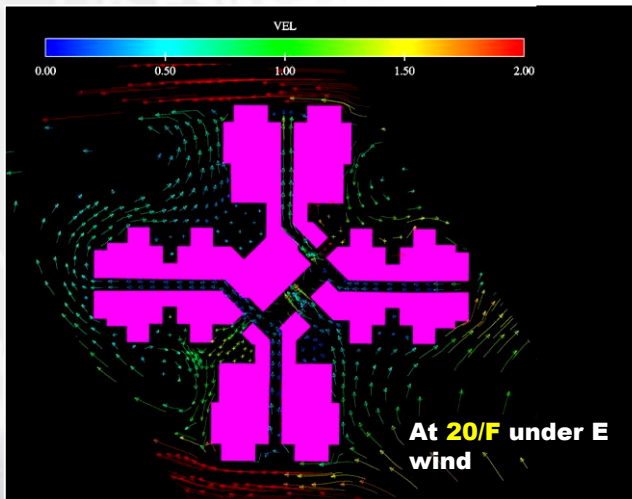
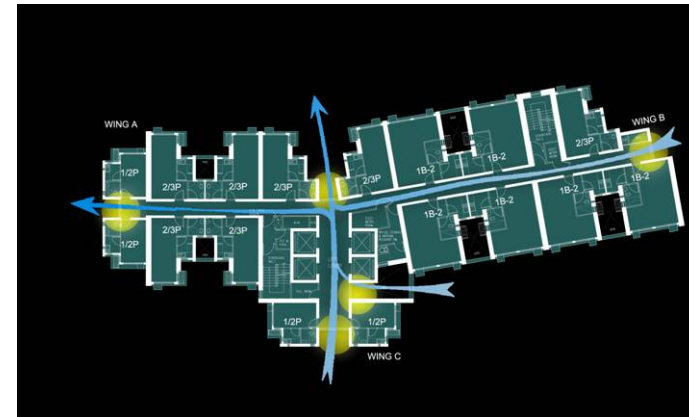
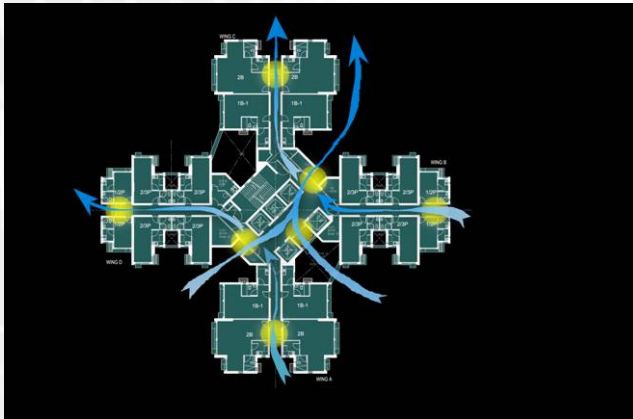
*To optimize the configuration and permeability of domestic block/flat design to achieve good natural cross ventilation in public circulation areas as well as individual flats to enhance comfort, disperse pollutant and save energy.*

***Natural Ventilation***

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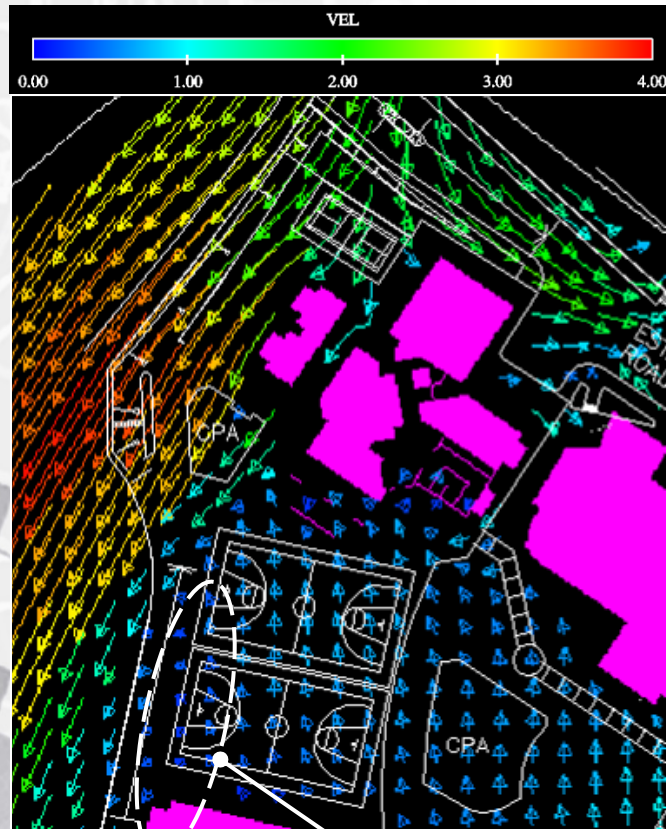
## Natural Ventilation in Common Areas



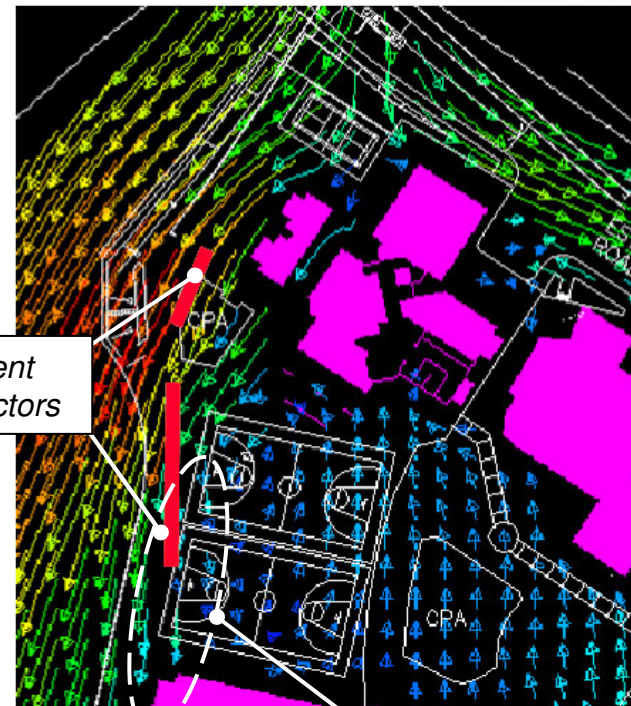
Ventilation significantly above the minimum requirement of **1.5 ACH** in PNAP 278



## *Wind Deflector Device to Enhance Ventilation*



Transparent  
Wind Deflectors



*The wind speed at the ball court improved with wind deflectors*





## ***Solar Heat Gain***

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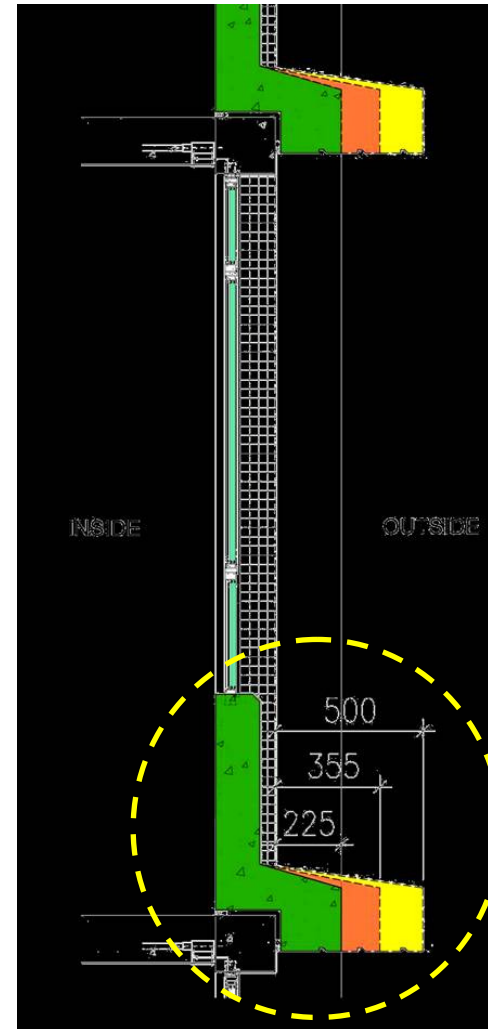
### ***Purpose:***

*To minimize solar heat gain inside domestic flats and outdoor areas in order to save energy and enhance human comfort.*





## *Environmental Facade*





## ***Natural Daylight***

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### ***Purpose:***

*To ensure that acceptable daylight level is provided inside the individual dwelling and indoor common areas of domestic block to ensure comfort, health and energy efficiency.*



## ***Heat Island Effect***

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***Purpose:***

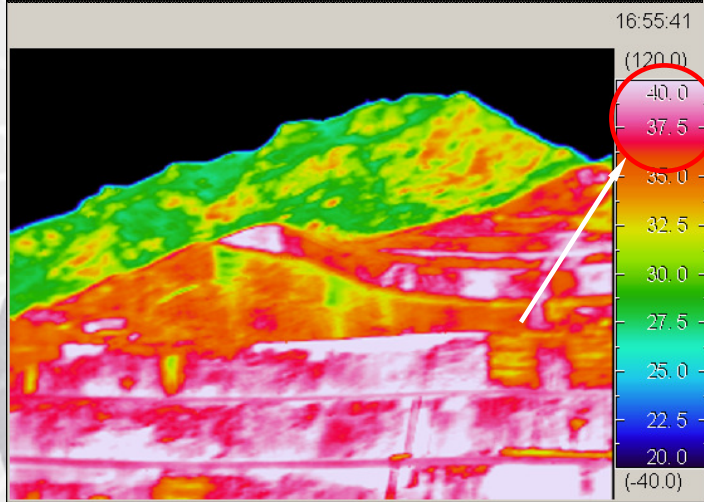
*To reduce heat island effect near pedestrian circulation area, passive and active open space to enhance human comfort within the development and the neighbourhood.*



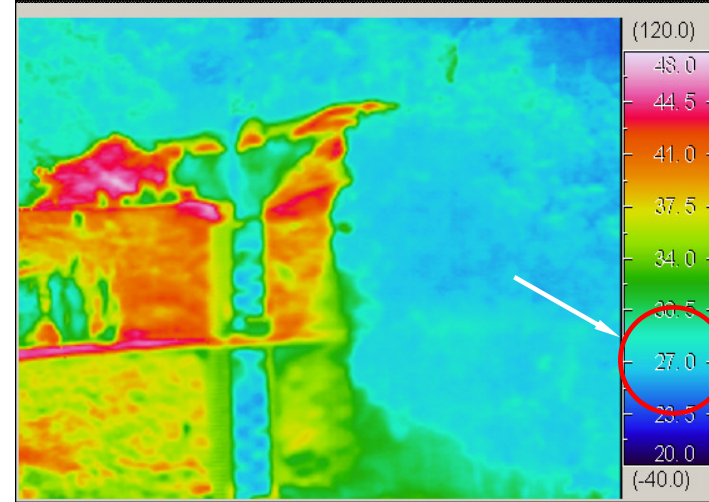
## Heat Island Effect - Thermal Comfort Analysis



Thermal image of slope without vegetation



Thermal image of slope with vegetation



## *Urban Greening to Reduce Heat Island Effect*



*Greening of Lift Tower, Plaza and Car Park*



*Greening of Roofs and Slopes*





## ***Pollutant Dispersion***

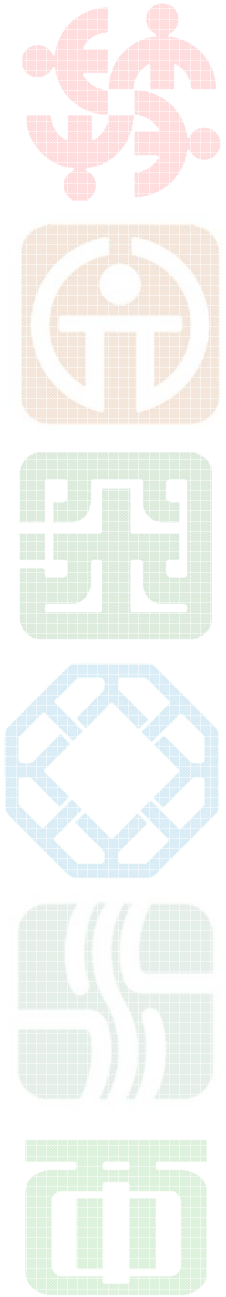
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### ***Purpose:***

*To ensure that pollutants generated within the development will be dispersed in an effective manner so as to avoid nuisance to the occupants both within or outside the development.*



## ***Public Consultation***



## Public Engagement



## *Conclusion*

*Micro-climate studies* have proven to be a **useful scientific design tool**, and opens up new opportunities to **bridge the gap between policies and practice** for the good of the coming generations.



*“We thrive and survive on planet earth as a single human family. And one of our main responsibilities is to leave to successor generations a sustainable future.”*

*UN Secretary-General Kofi A. Annan*

**Thank You**

