Building Regulations and Urban Policies as Incentives for Application of District Cooling Systems in Singapore

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Energy-driven urban design aims at providing urban configurations that decrease energy demand, particularly considering and responding to the interdependencies between the energy systems and the urban form for higher energy performance.
Larger Scope
Larger Scope

Interdependencies

↓

Urban design guidelines

↓

Applicability of this concept in design in the existing mode of urban development in Singapore
Larger Scope

Interdependencies

Urban design guidelines

Applicability of this concept in design in the existing mode of urban development in Singapore: policy matters.
Background

• The global trend calls for serious and responsible actions on carbon emission reduction.

• Singapore has pledged to reduce CO2-emissions by 36% in 2030 at COP21 (Ho 2015).

• District cooling systems (DCS) offer a solution for better energy performances as well as resilience-related, economic and environmental benefits (UNEP 2014).

• There are multiple DCS plants in Singapore. As part of a special urban policy for the development of the Marina Bay Business District, most buildings in the area are mandatorily required to connect to DCS (Zhuang 2016).
DCS’ influence on aspects of urban design

**Space saving** - the space freed up by removing cooling facilities from the building rooftops and basements. It improves aesthetic and efficiency of the building and the city. Cooling towers on the rooftop can be replaced by sky gardens or terraces; chillers in the basement can be replaced by interconnected underground pedestrian tunnels.

For example, the ship-like infinity pool floating over the three towers of Marina Bay Sands would not be realized without the DCS.
DCS’ influence on aspects of urban design

*Noise reduction* - the removal of cooling facilities takes the noises away from the urban environment especially street canyons.

*Building program (land uses)* - DCS desires a stable consumption of the cold produced. Offices, for example, consume mainly in the daytime while residential buildings consume mainly at night. Thus, to maintain a stable and constant consumption pattern throughout the day, a mixed-use of various building programs with various types of occupancy, usage, time-of-the-day and weather conditions is beneficial (Tey 2010; Fonseca & Schlueter 2016).
Research Question

• What is the role and the status quo of planning and building regulations and relevant urban policies on the application of DCS in Singapore?

• What changes can be made that may improve the efficiency of DCS and incentivize developers and proprietors to consider such system?
Methodology

- **Direct incentives** - the incentives directly applied for the adoption of district cooling systems.
- **Indirect incentives** - the incentives benefiting from the results of the DCS’s influence on various aspects of the building projects.

- A review of the incentives initiated by the governmental authorities in Singapore, including BCA (Building Construction Authority) and URA (Urban Redevelopment Authority)
- A roundtable discussion on DCS. Participants include academic researchers and DCS providers in Singapore and China.
Results

Direct Incentives
- GFA bonus
- Rooftop freed-up

Indirect Incentives
- GFA exemption
- Underground freed-up
- GreenMark Points
- Energy efficiency & noise control

Constraints in practices
- Versatile residential occupancy
- Less sellable area
- Electricity tariff

Positive impacts

Negative impacts

Influence on various aspects of building projects

DCS in SG
Discussions

• **Interdependencies on different levels.** Various levels of urban development, e.g. urban planning and design, building design. Various stakeholders, e.g. governmental authorities, designers, developers, cooling providers, customers

• **Residential or not?** Decisions by stakeholders from various points of view.
Conclusions

• The application of DCS is **multifaceted** and more than merely a technical, a commercial or a policy issue.

• **Policy matters.** Building regulations and urban policies can work as direct or indirect incentives to promote voluntary connections. However, any adaptations of such regulations and policies should be carefully evaluated before coming into force.
Outlook

• Future studies on district cooling systems will include ideas, and experiences from all the stakeholders involved in the lifespan of a building project. This includes cooling providers, policy-makers, developers and district cooling customers.

• Beyond DCS, similar studies concerning policies can be extended to other energy technologies.
Applicability of this concept in design in the existing mode of urban development in Singapore: Policy Matters!
Applicability of this concept in design in the existing mode of urban development in Singapore: **Policy Matters! Benefits for all matter!**
Thank you!

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References


