Country-Wide Assessment of District Energy Feasibility Using GIS

International District Energy Association

107th Annual Conference & Trade Show, St. Paul, MN

June 22, 2016

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Project Overview

- Our discussion will address the following areas:
  - Background & rationale for project
  - Technical approach & challenges
  - Notable project elements

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Project Background

- Qatar – State in Middle East with population of ~2.3 million
- Development of District Cooling regulatory framework for Qatar
- Decree stating that potable water is not to be used for District Cooling

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Project Background

Assessment of District Cooling (DC) Potential for Qatar

- Entirety of Qatar assessed for DC applicability
- For use as a tool in future regulatory development

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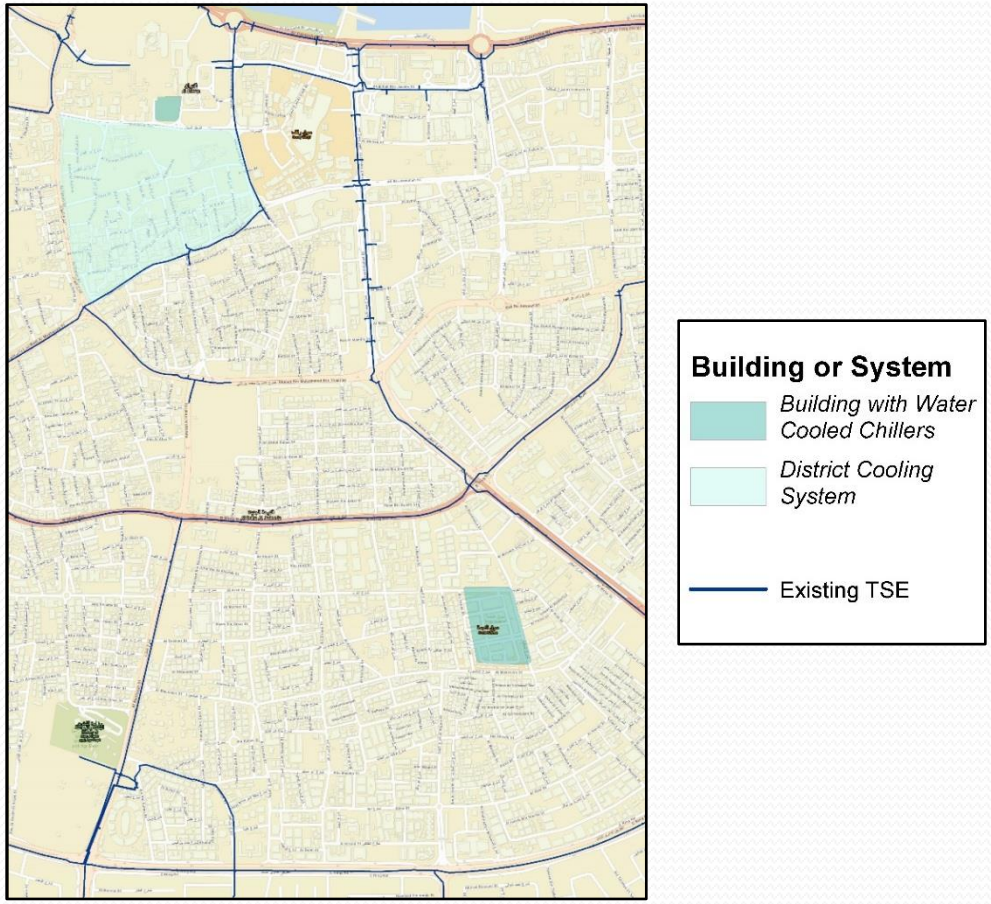
Analysis Input Data - GIS

- GIS data containing:
  - Plot boundaries
  - Qatar Zone boundaries
  - Street right of ways (RoWs)
  - The existing treated sewage effluent (TSE) network
  - The proposed future TSE network
  - Existing cooling plant (CP) locations



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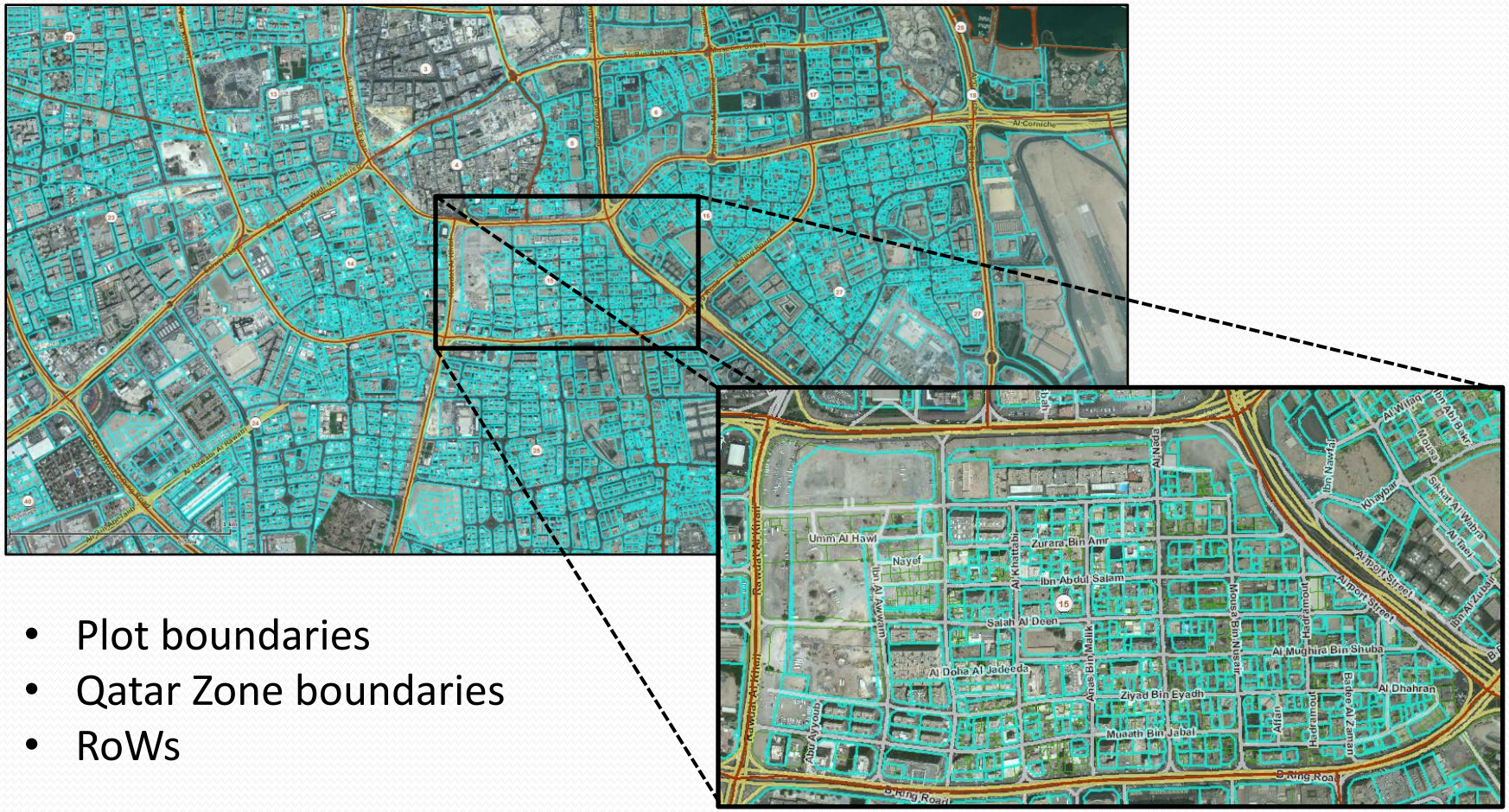
Analysis Input Data - GIS



- Plot boundaries
- Qatar Zone boundaries
- RoWs

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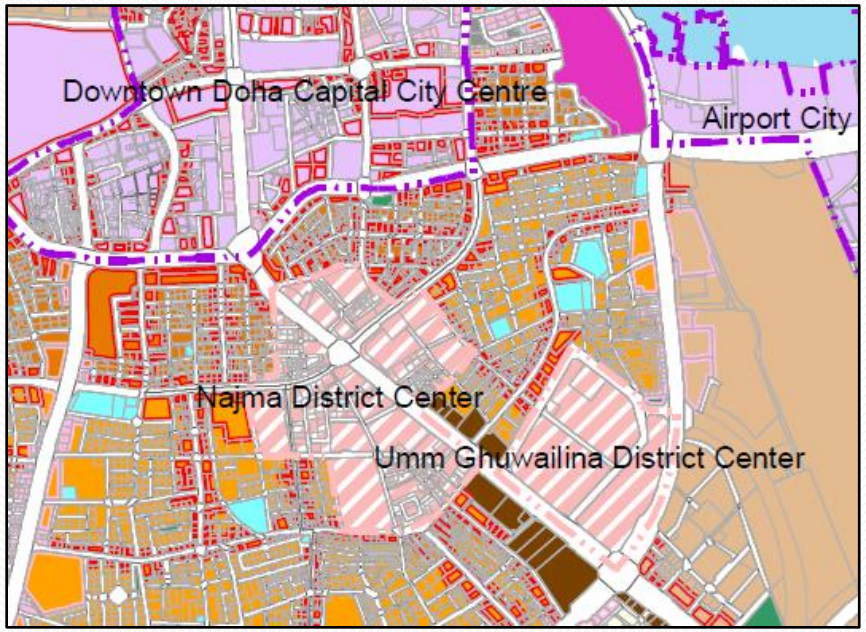
Analysis Input Data – Zoning Information

- Zoning information for each zoning designation containing:
  - Maximum allowable building coverage as percentage of plot
  - Maximum allowable building height range
  - Maximum allowable Parcel FAR



Max. Building Height	Min lot size	FAR	Building Typology
G+2	300m²	1.9	Shop Top Housing
G+4	800m²	1.6	Podium and Tower
G+8	1000m²	4	Podium and Tower
G+13	1200m²	5.8	Podium and Tower
G+13	1600m²	6.4	Podium and Tower

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Assessment Mapping Analysis Challenges

- No GFA projections available
- Average cooling density per zoning designation calculated utilizing:
  - Zoning information
  - GIS Plot data
  - Developed/undeveloped area
    - Satellite imagery
  - Cooling load intensity assumptions
  - Average building heights

Buildings and plot boundaries within an Assessment Map Zone.

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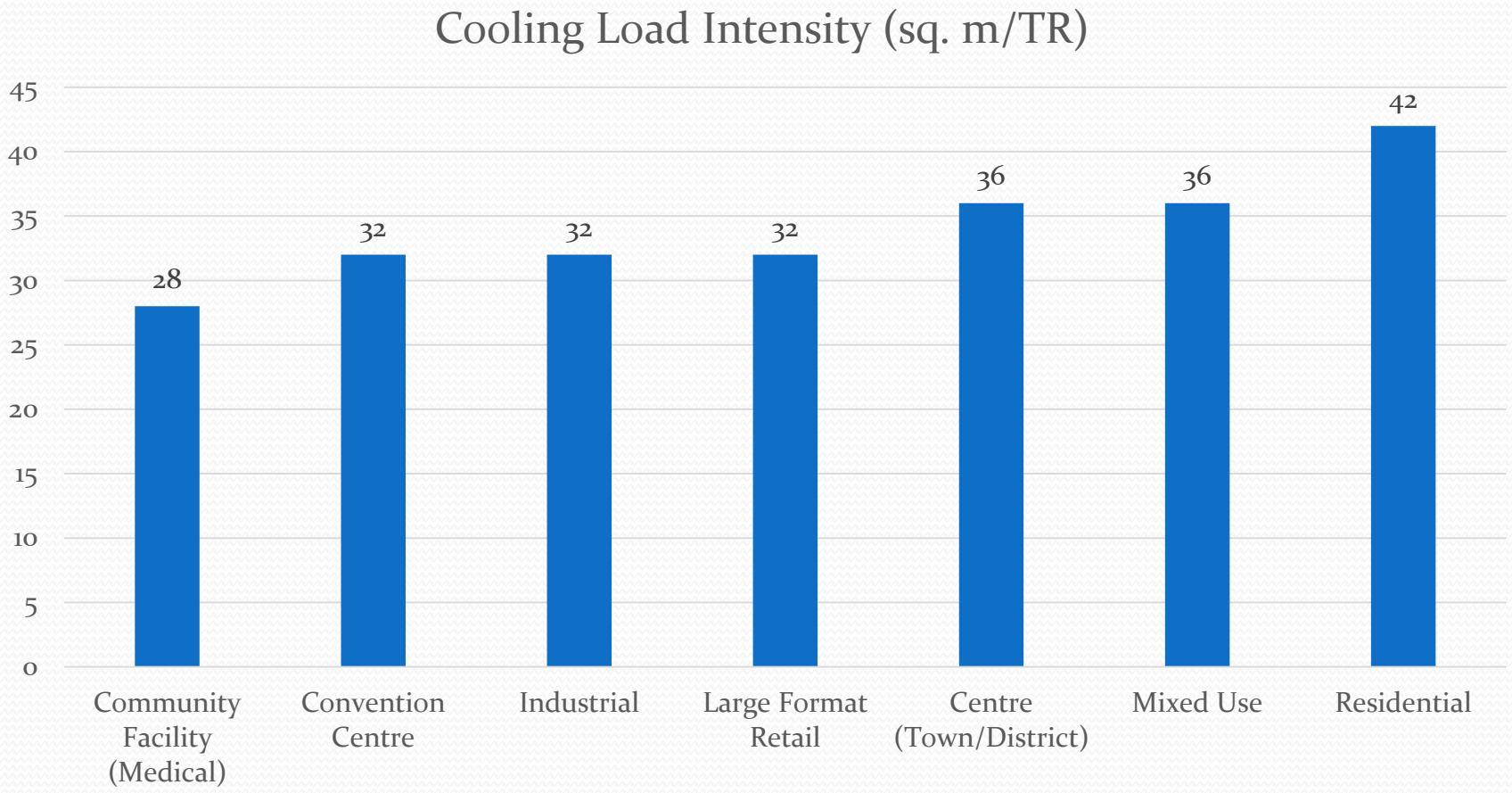
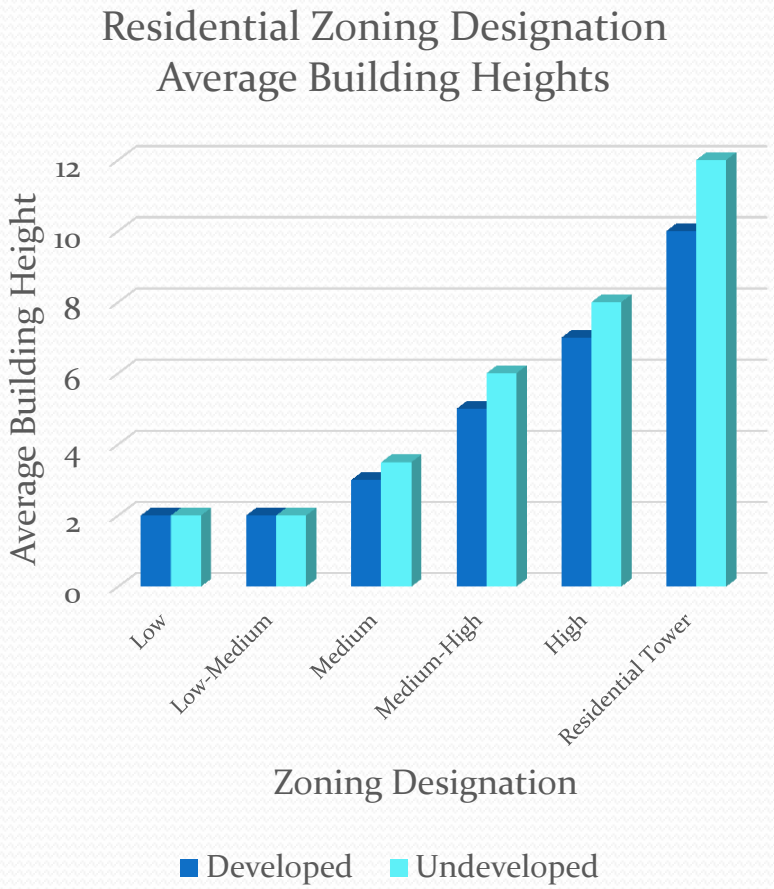
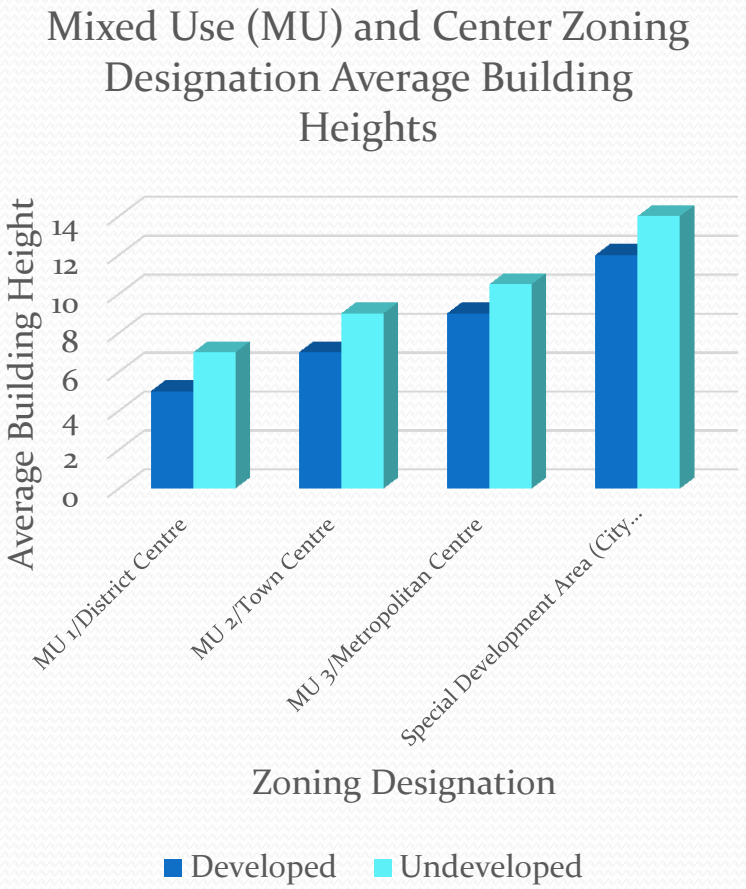
Assessment Mapping Analysis - Cooling Load Estimation



Assessment Mapping Analysis - Cooling Load Estimation





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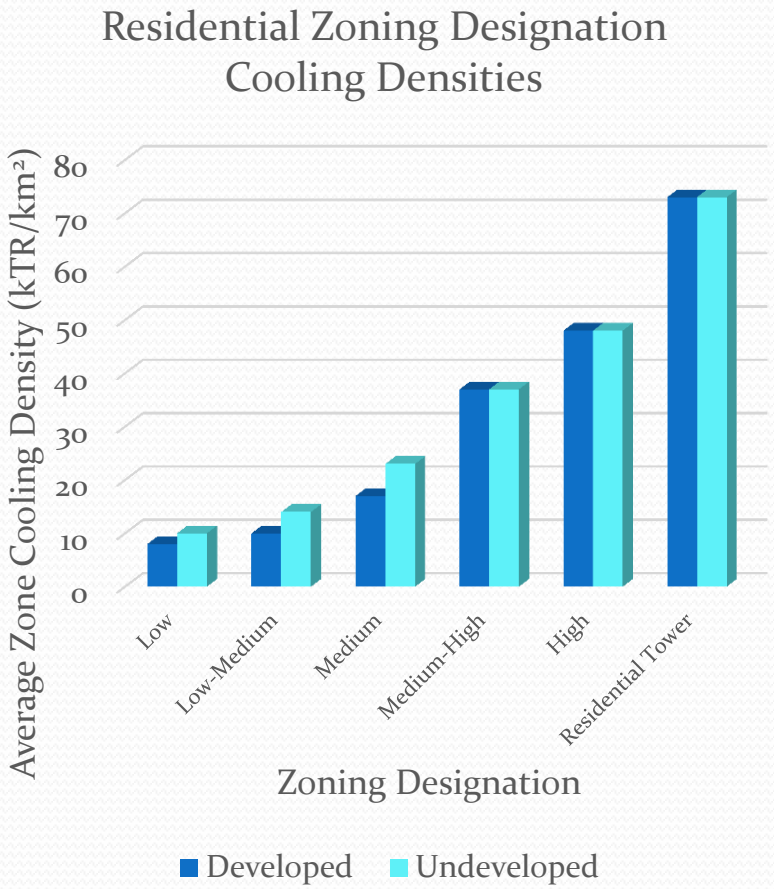
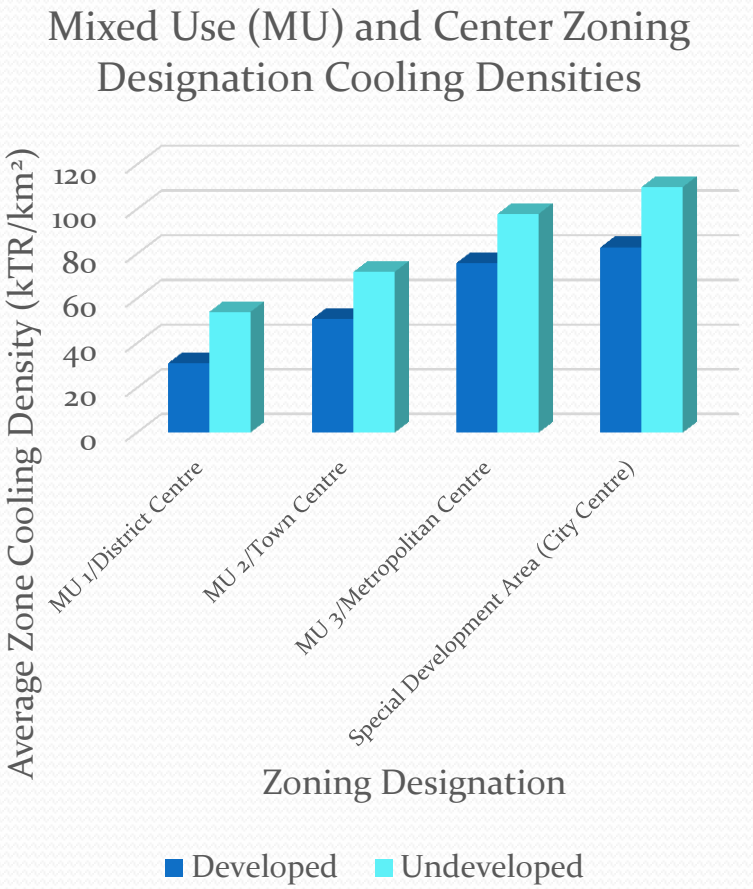
Assessment Mapping Analysis - Cooling Load Estimation





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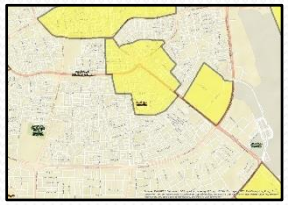
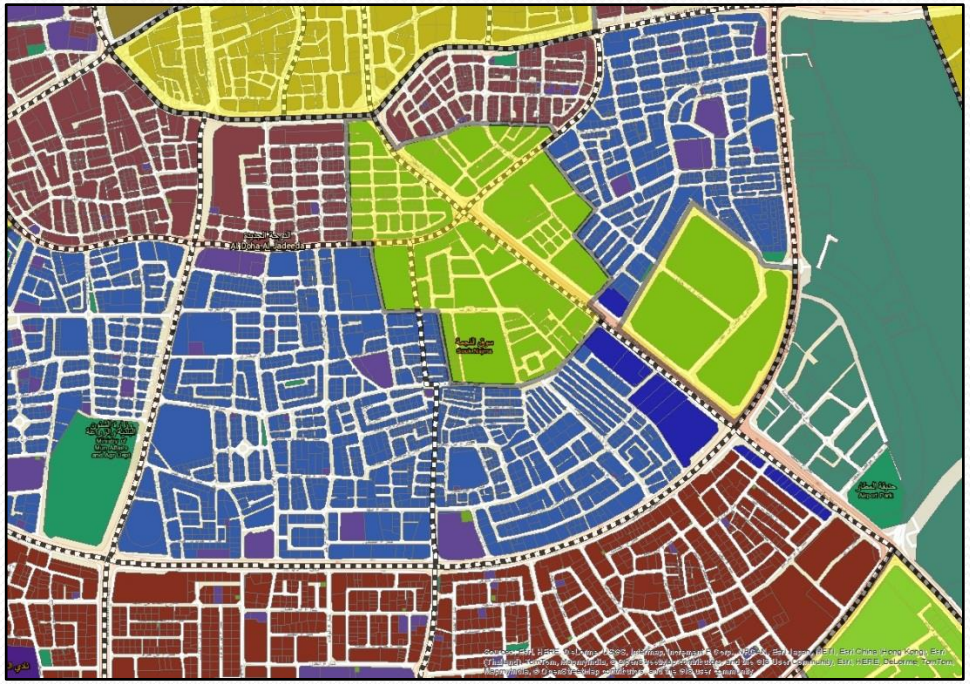
Assessment Mapping Analysis - Zones Development

- 227 Assessment Map Zones created coincident with one of the following:
  - Zoning designation extents

  - Centre boundaries

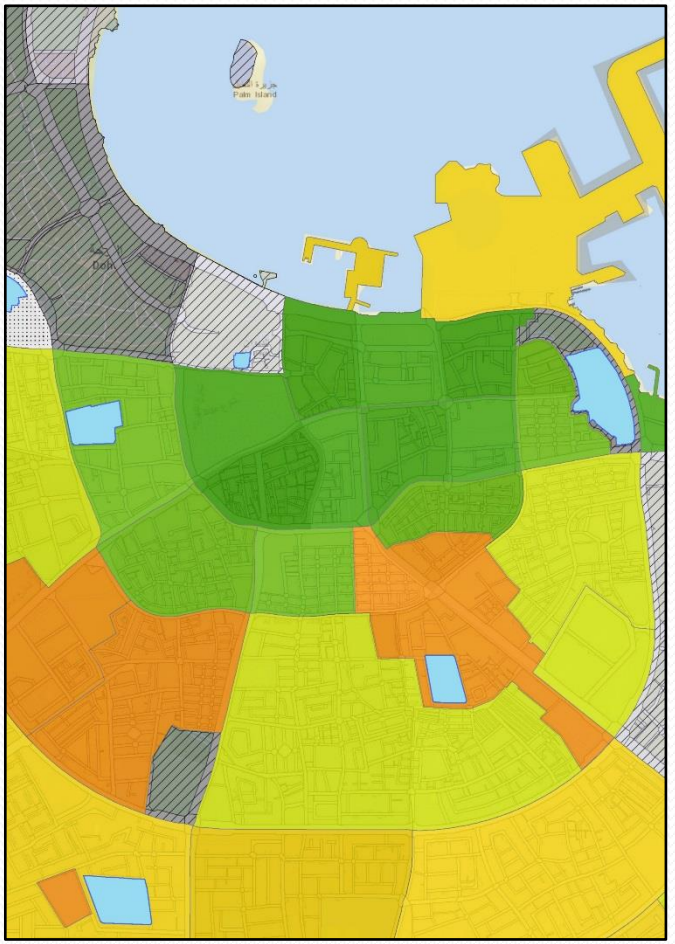


  - Qatar Zone boundaries



Assessment Mapping Analysis - Zones Development

- Cooling load density calculated for each Assessment Map Zone using:
  - Weighted average of cooling load density figures for each zoning designation
  - Percentage of developed and undeveloped area
- Cooling Plants added to Assessment Map



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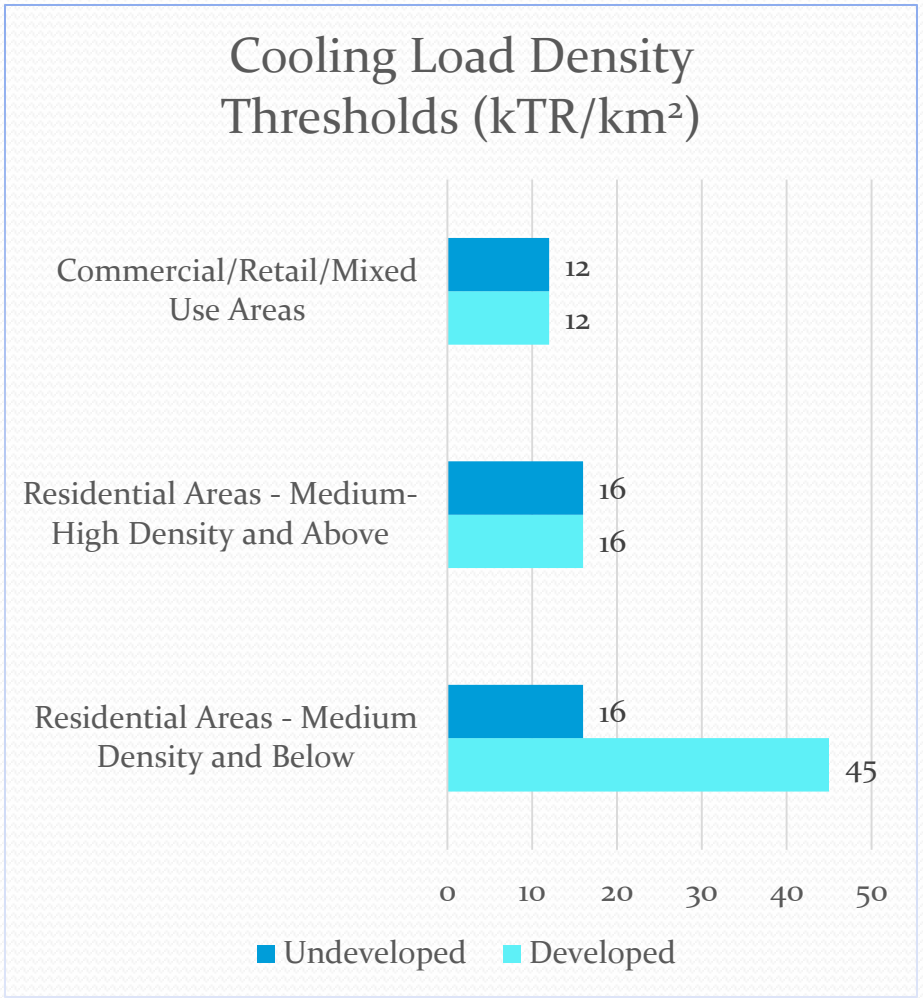
Minimum Requirements for DC Applicability

- Cooling load for a given Assessment Map Zone must be at least 5,000 TR
- Cooling load density must exceed threshold criteria



Assessment Map Grading Methodology

- Cooling load density
- Percentage of undeveloped versus developed land
- Proximity to existing or proposed future TSE network
- Proximity to sea (if not in close proximity to TSE network)

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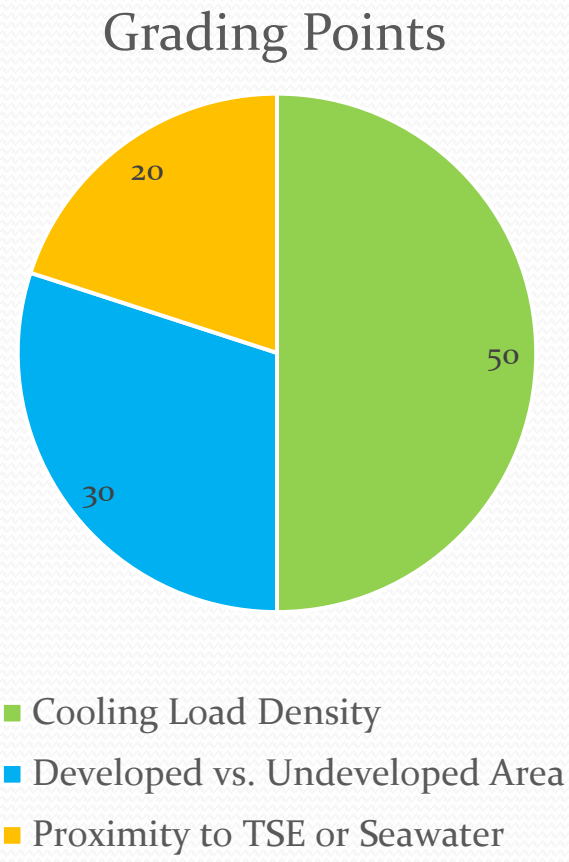
Assessment Map Grading Methodology



Grading Scale	Grade
Point total between 85 and 100	A
Point total between 70 and 85	B
Point total between 55 and 70	C
Point total between 40 and 55	D
Point total between 0 and 40	E

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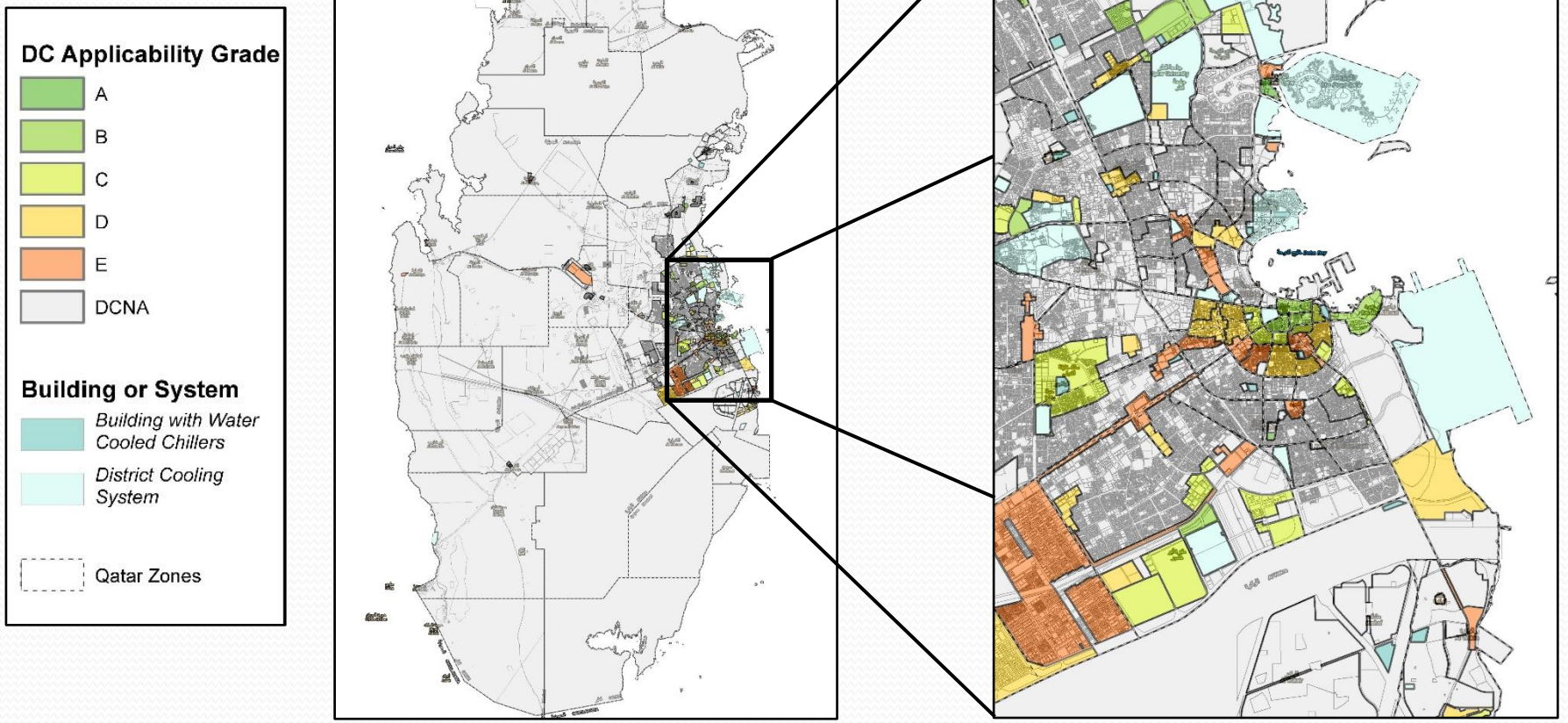
Assessment Mapping Results

The State of Qatar

Greater Doha Area



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Assessment Mapping Results

Greater Doha Area

Downtown Doha Area

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Thank you!

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