

Municipal Scale Integrated Energy System Models

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Energy-Water, Eastern Region Needs
Workshop

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Climate variability will hasten the need and pace for adaptability of urban environments

- Endless policy debates need to be substituted by true strategic planning and
- infrastructure improvements
- EPA Region II is developing two intergrated urban energy system models
- With materials flows (solid and liquid wastes with possible extension to
- potable water issues.

Two case studies : New York City and Carolina, Puerto Rico

- IEA-MARKAL model platform is the base
- Electric sector is modeled with electric utility substation and then soft linked
- to building simulation model USDOE-Energy Plus
- Using the substation as the boundary waste management is modeled for the district.

Urban Heat Island used as a challenging mechanism for the built environment

- Providing energy and waste management
- for buildings in the UHI provides the initial
- test case.
- Building from the electric substation
infrastructure other infrastructure systems
- will be added.

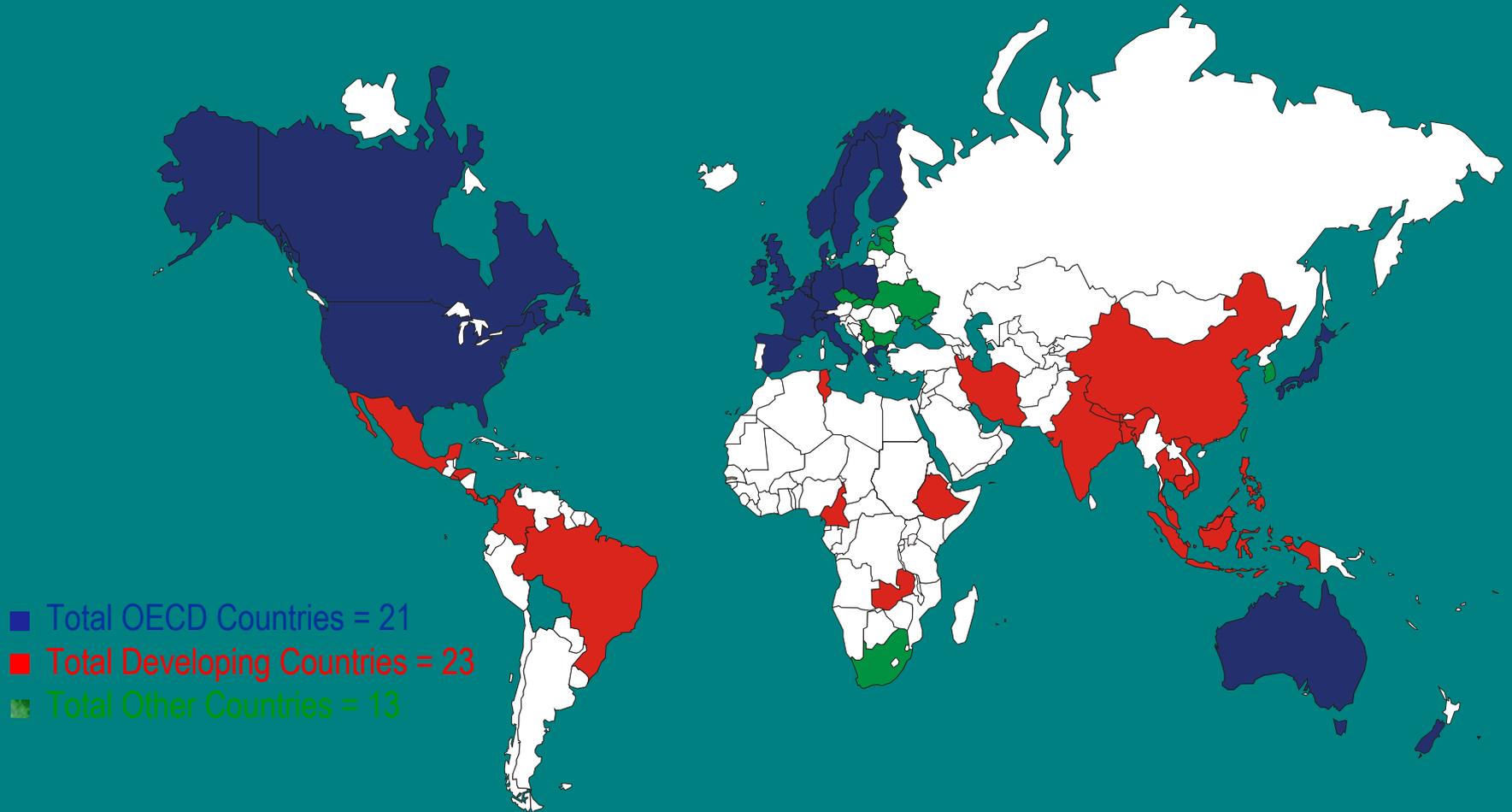
Technology and Management System Choices for the UHI District

- Electricity and waste management may
- be decentralized.
- Environmental Management Systems for
- the UHI district and individual building clusters.
- Efficiency in energy and waste management will be the key .

Validation of concept in NYC

- Integrated MARKAL in Carolina, Puerto Rico becomes “proof of concept”
- Leads to materials flow in NYC MARKAL model
- Key stakeholder: US Conference of Mayors, public utilities and Wall Street.

MARKAL Users



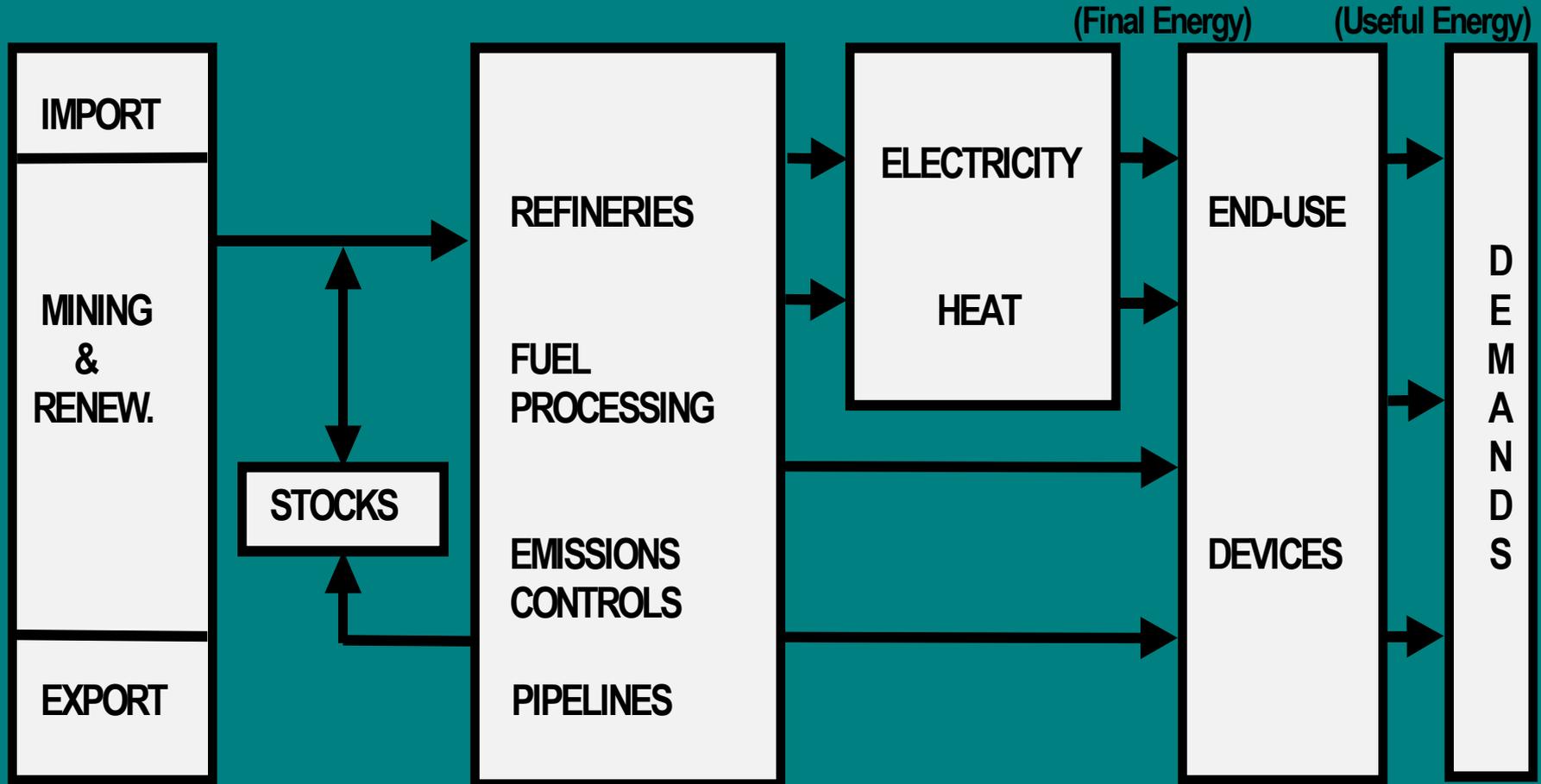
MARKAL Building Blocks

RESOURCES

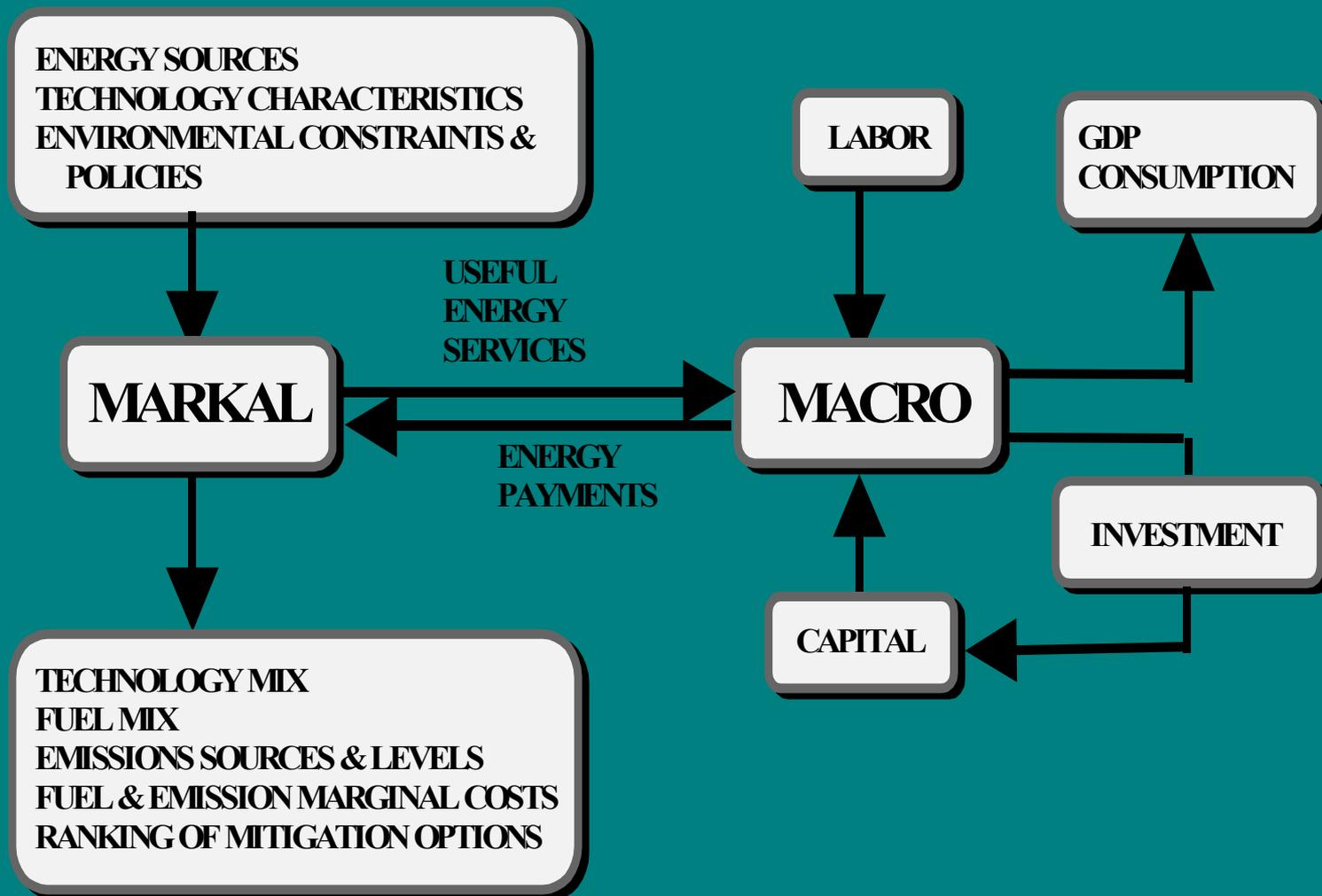
PROCESSES

GENERATION

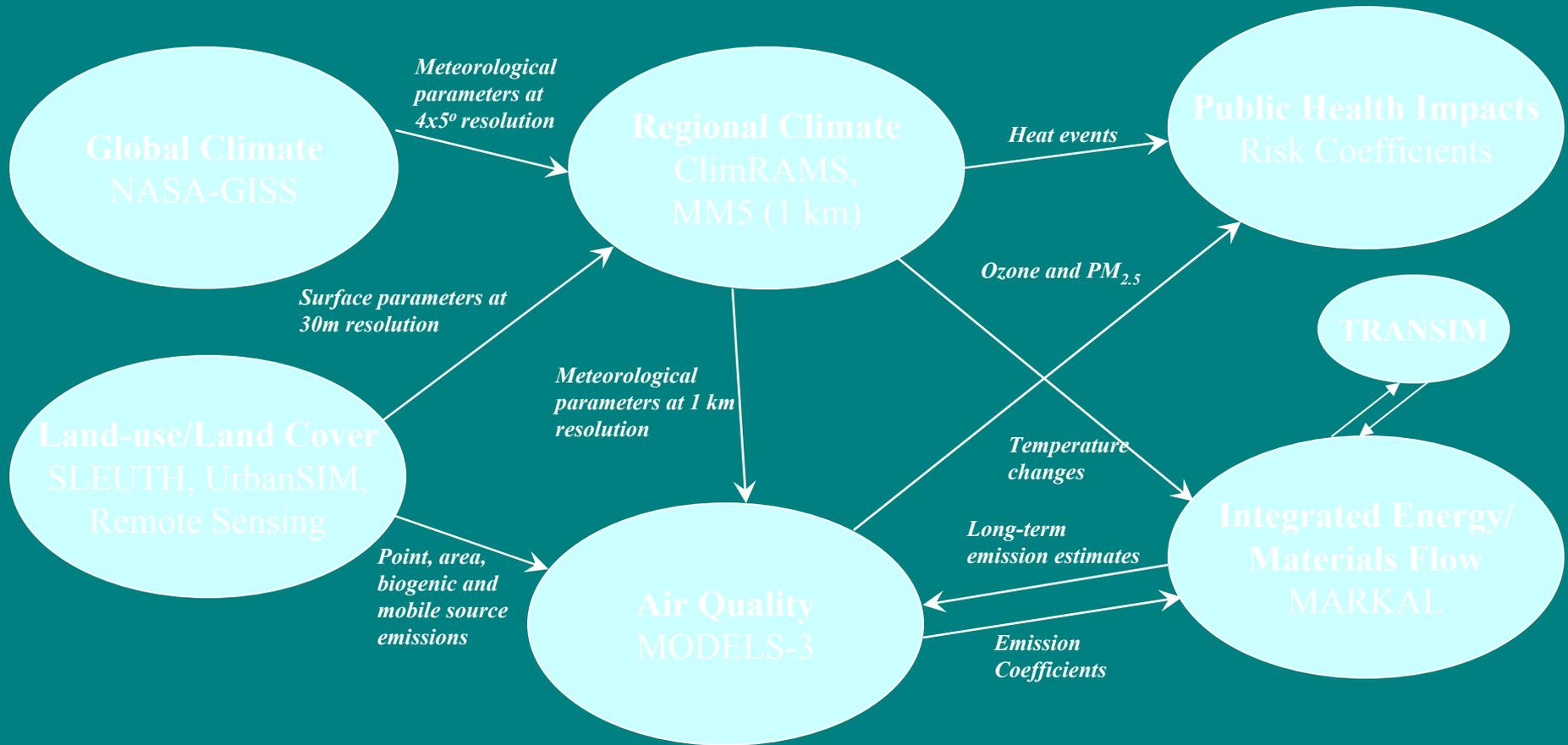
ENERGY SERVICES



MARKAL-MACRO Overview

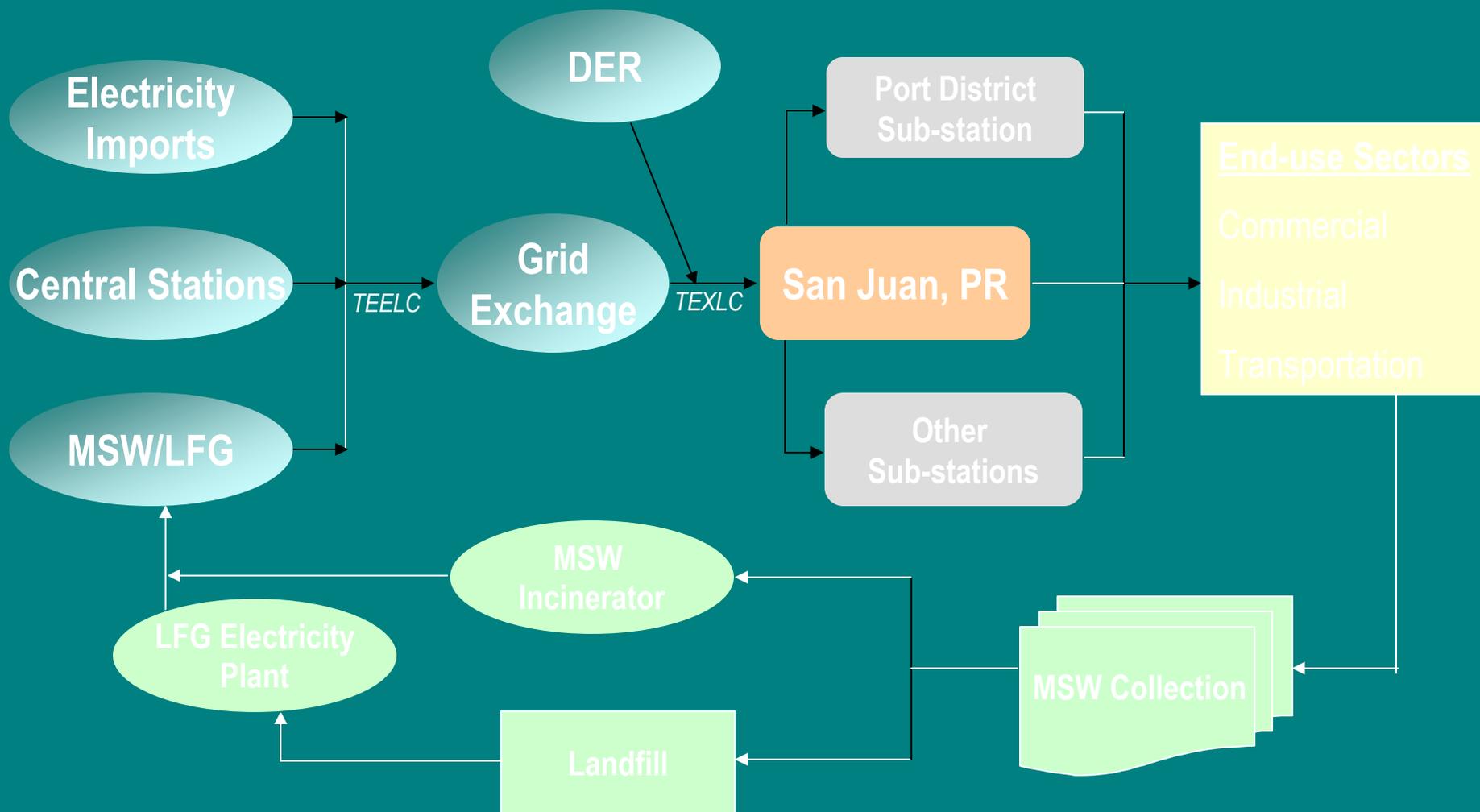


Integrated Modeling Framework for Reducing the Thermal & Emissions Footprint of the Port District



Outputs: SIP Credits, GHG Credits
Template for Multi-port System Efficiency Evaluation

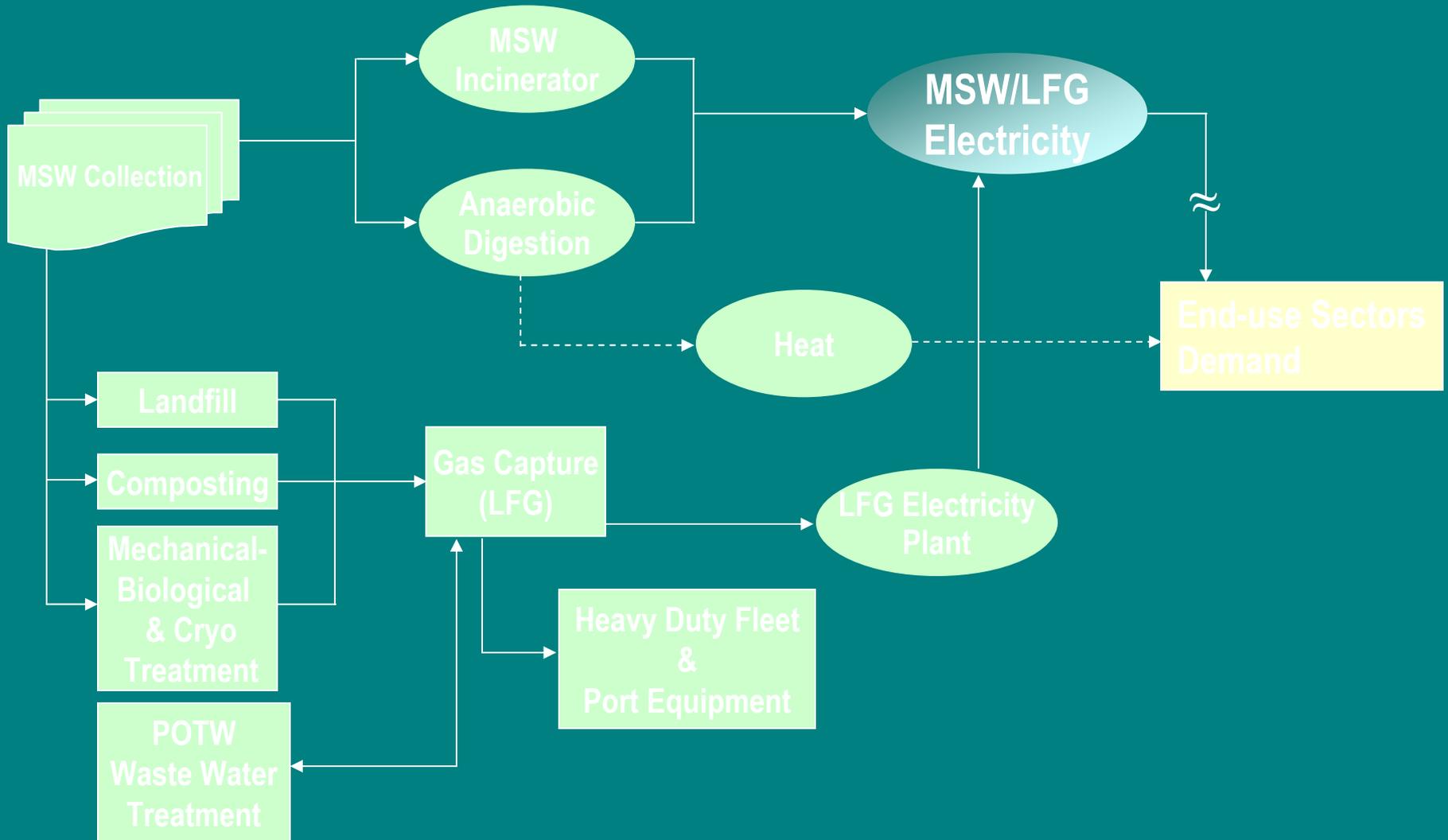
Port District & Municipal Scale MARKAL Model for Reducing GHG Emissions



LFG: Landfill Gas (Methane), DER: Distributed Energy Resources
TEELC: High Voltage Electricity Transmission, TEXLC: Low Voltage Electricity Transmission

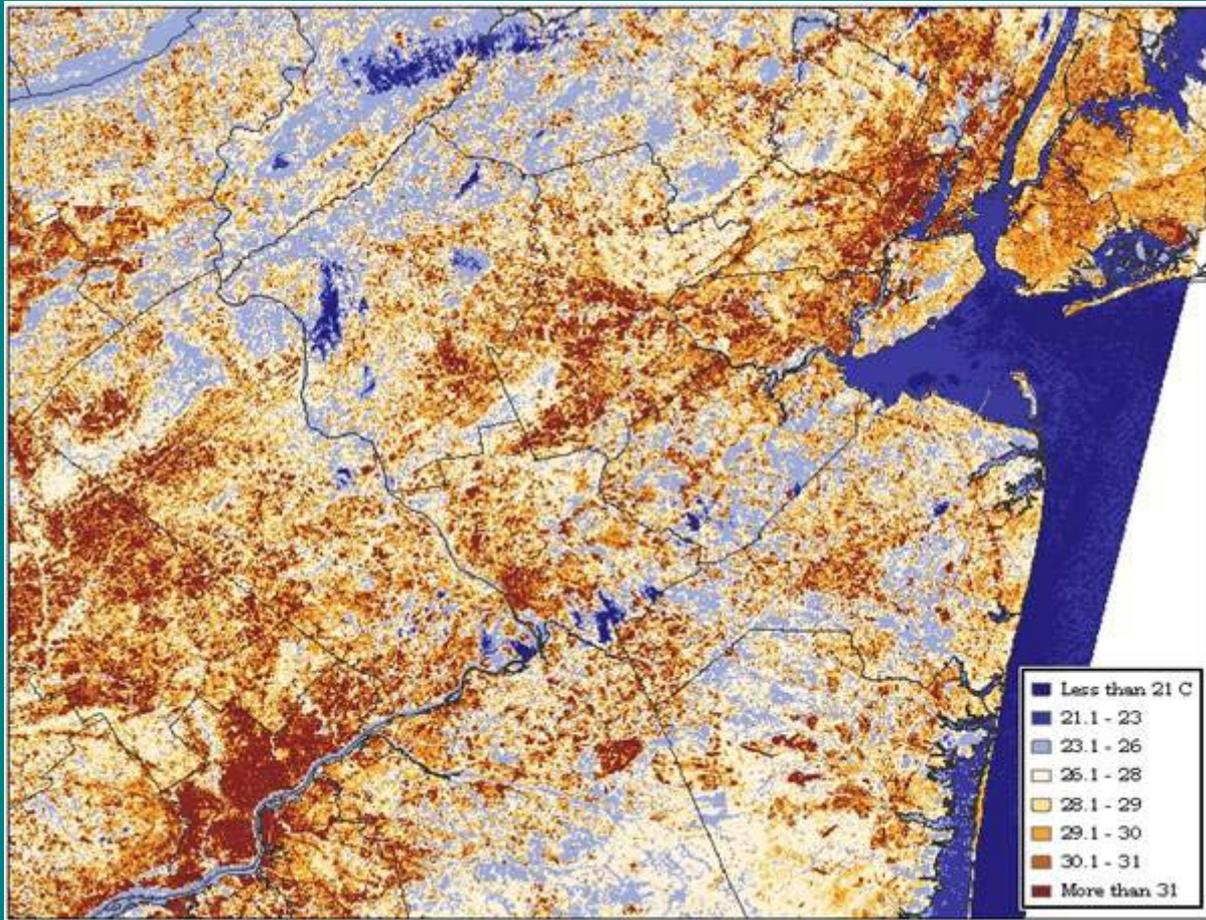
Materials Flow in MARKAL

Municipal Solid Waste & Waste Water

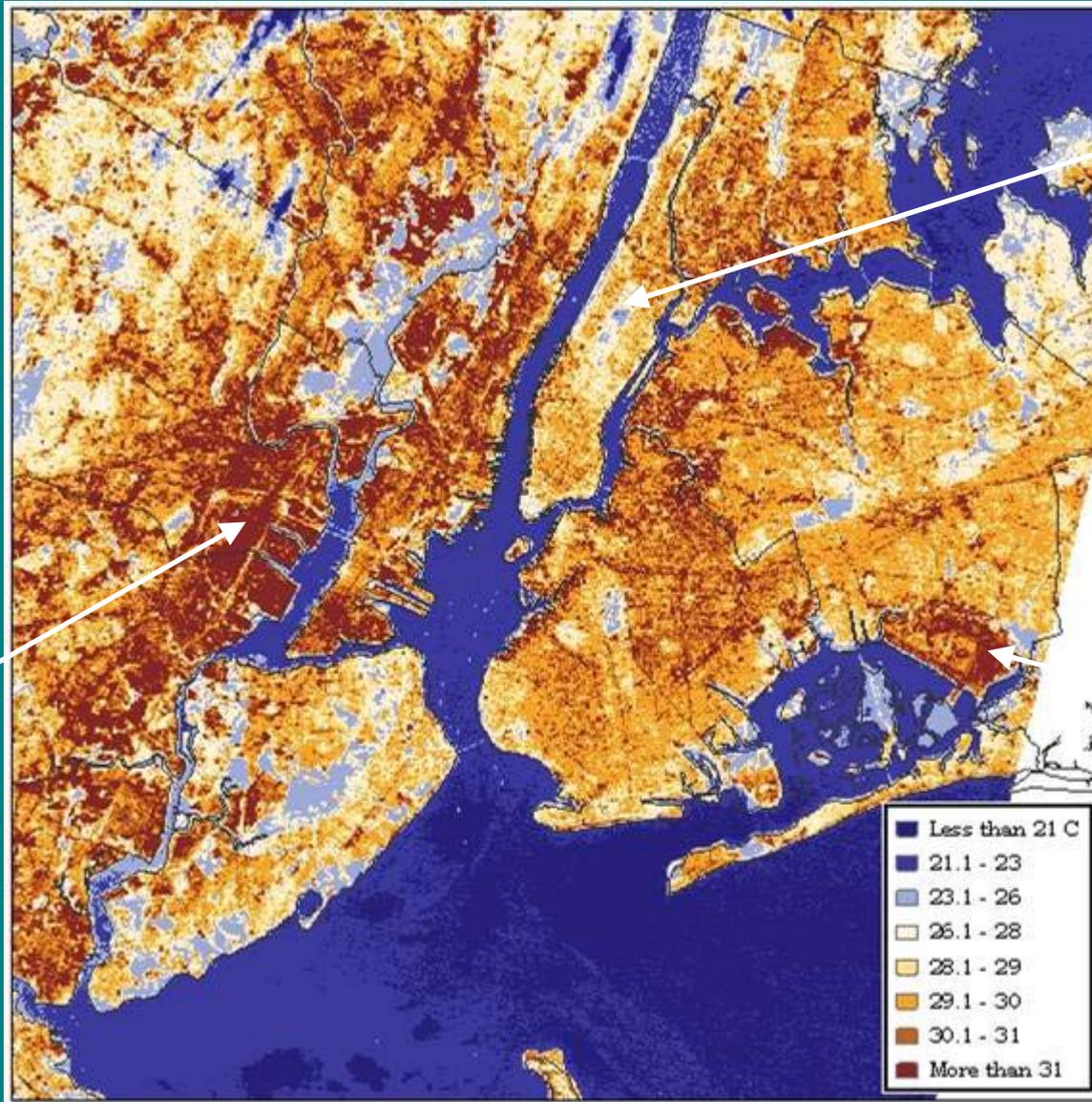


Overview

Our objective is to define the statistical relationship between surface temperature and a set of potential explanatory variables within New York City.



New York City Surface Temperature



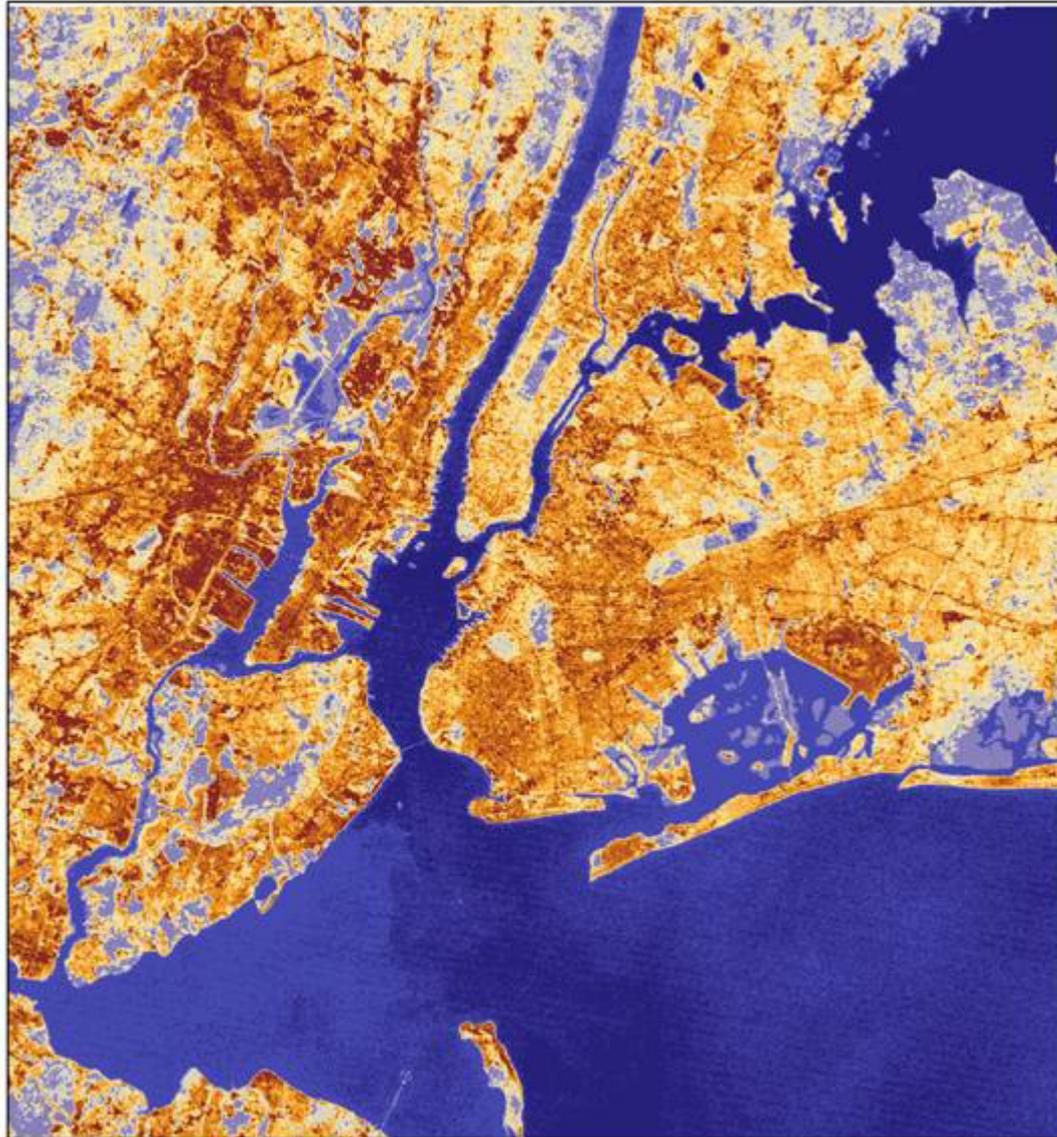
Central
Park

**SURFACE
TEMPERATURE**
Landsat ETM 7
Aug 14 2002
10:30 AM

Newark

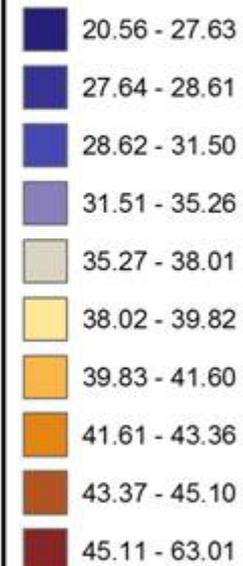
JFK

New York City Surface Temperature

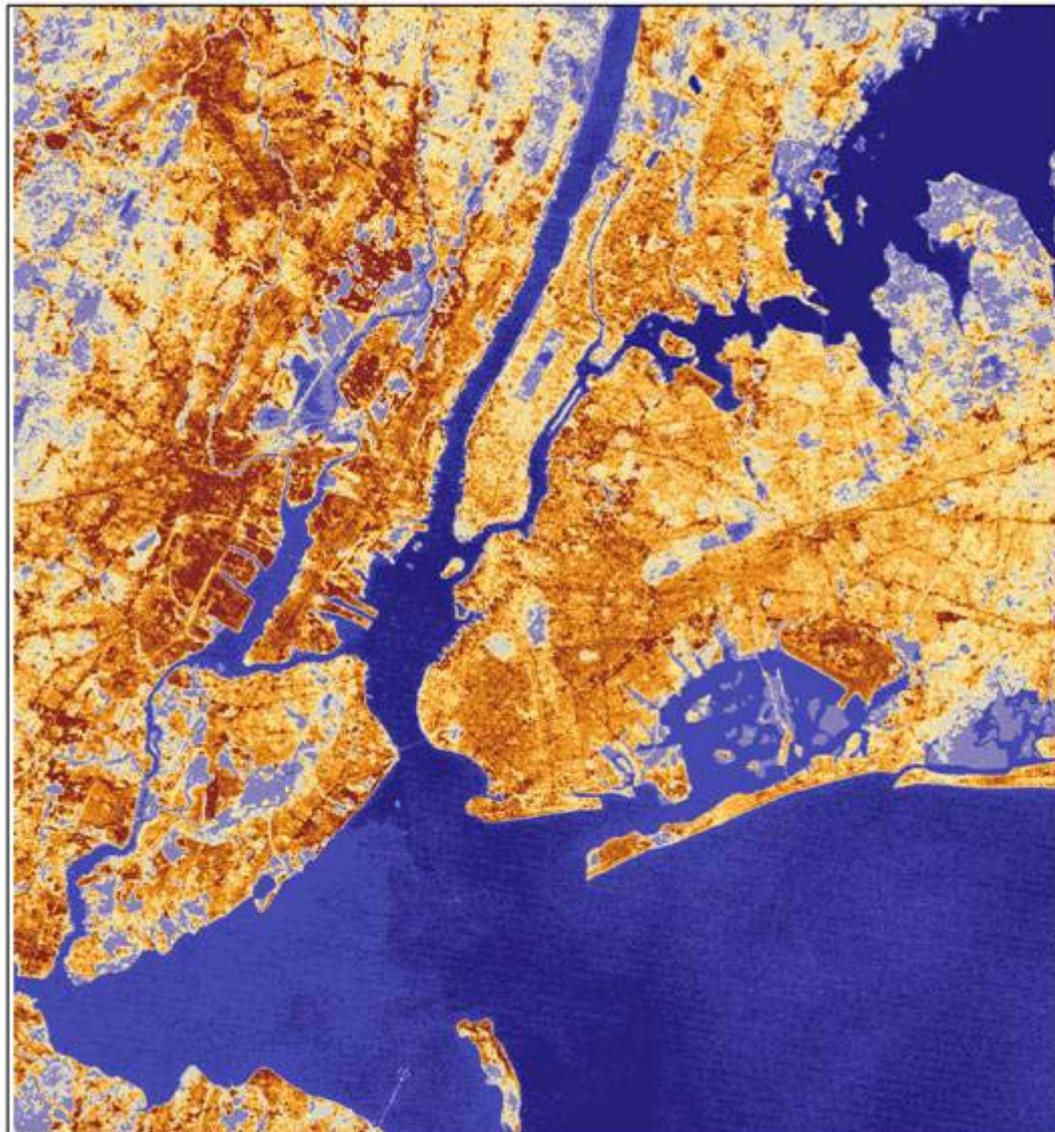


SURFACE TEMPERATURE
Landsat ETM
July 22 2002
10:30 AM

Legend



New York City Surface Temperature



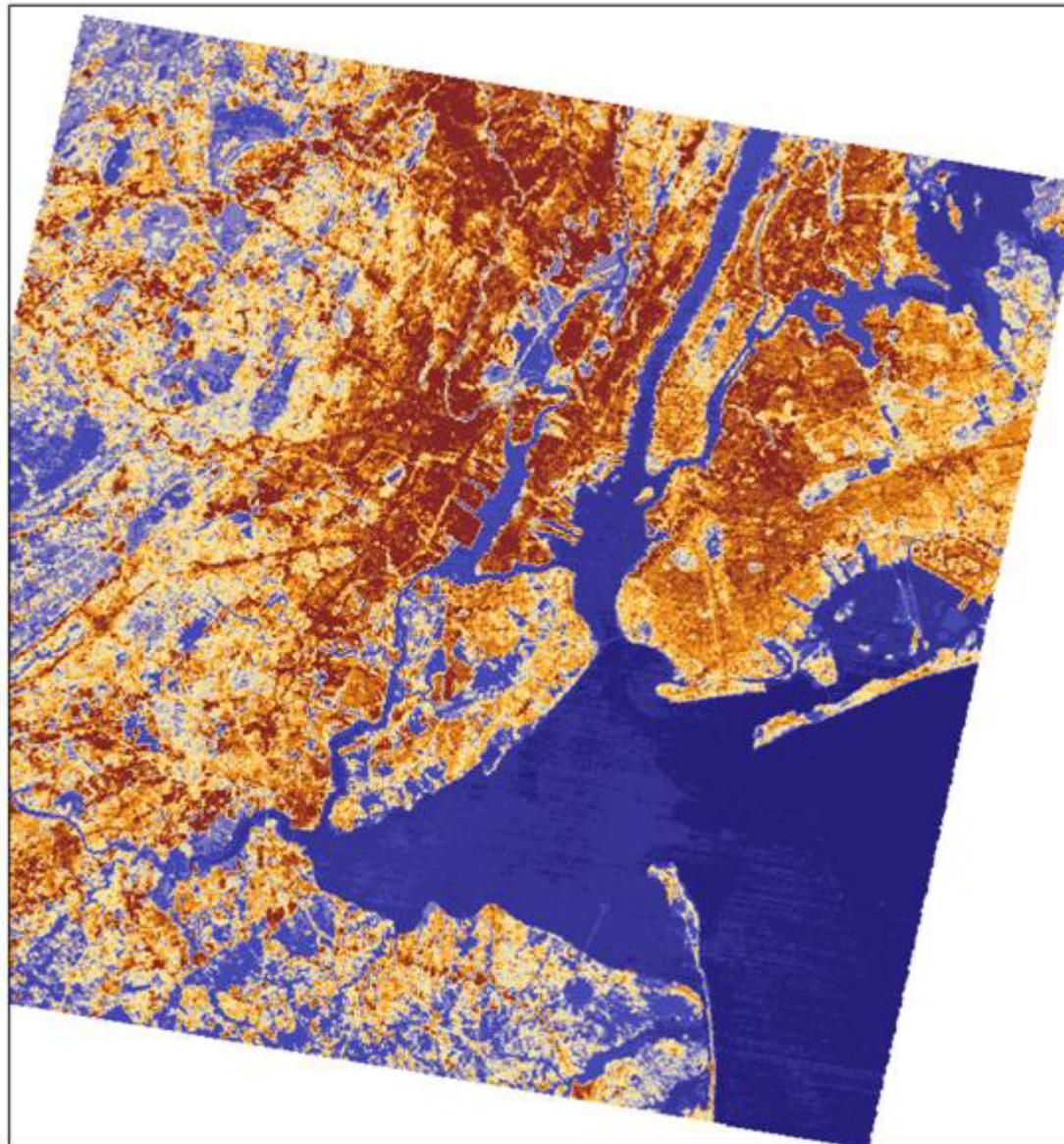
SURFACE TEMPERATURE
Landsat ETM
Sept 08 2002
10:30 AM

Legend

■	20.26 - 25.44
■	25.45 - 26.17
■	26.18 - 28.31
■	28.32 - 31.11
■	31.12 - 33.17
■	33.18 - 34.53
■	34.54 - 35.87
■	35.88 - 37.20
■	37.21 - 38.52
■	38.53 - 52.26



New York City Surface Temperature

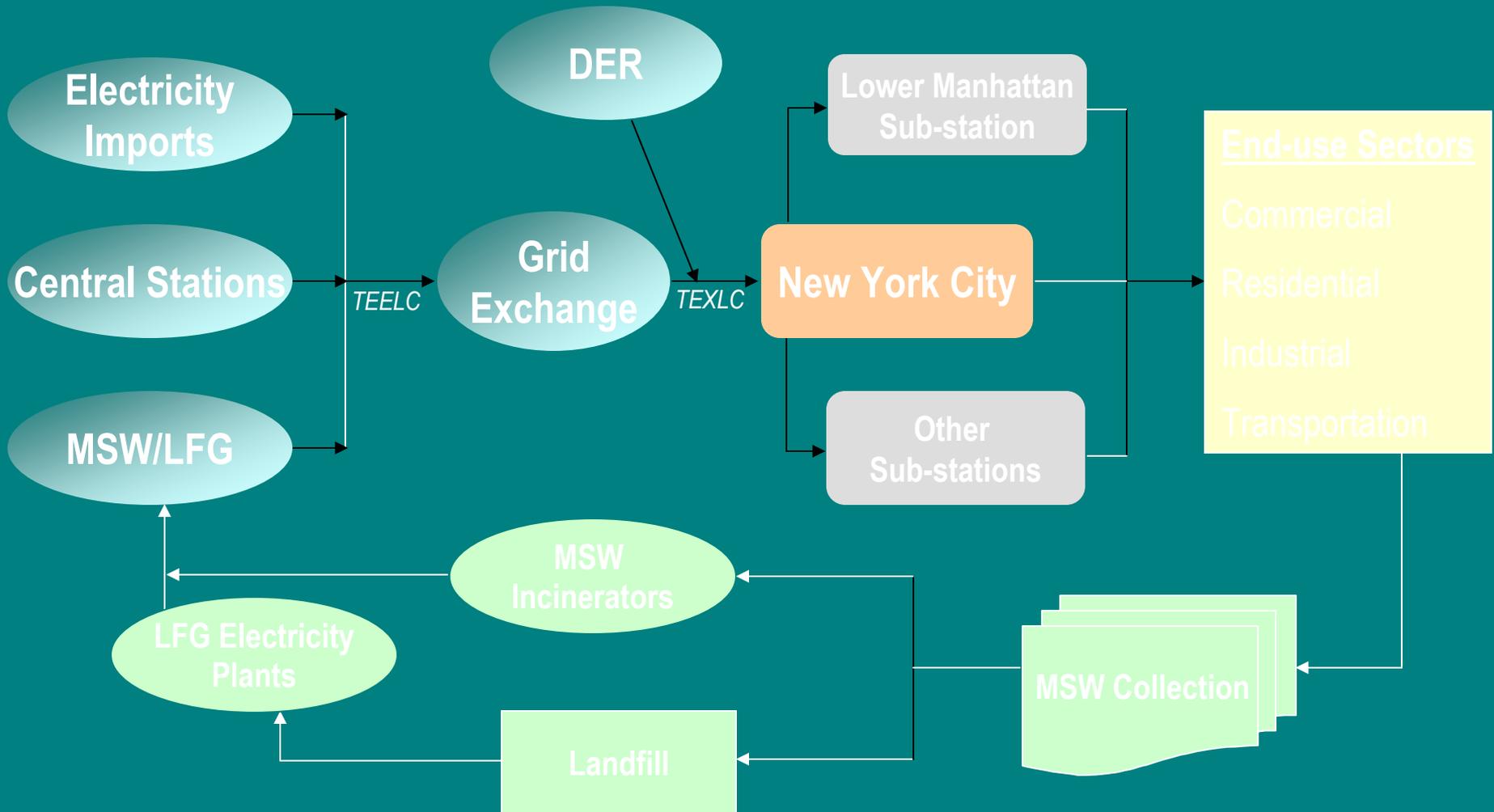


**SURFACE TEMPERATURE
ASTER
Sept 08 2002
10:30 AM**

Legend



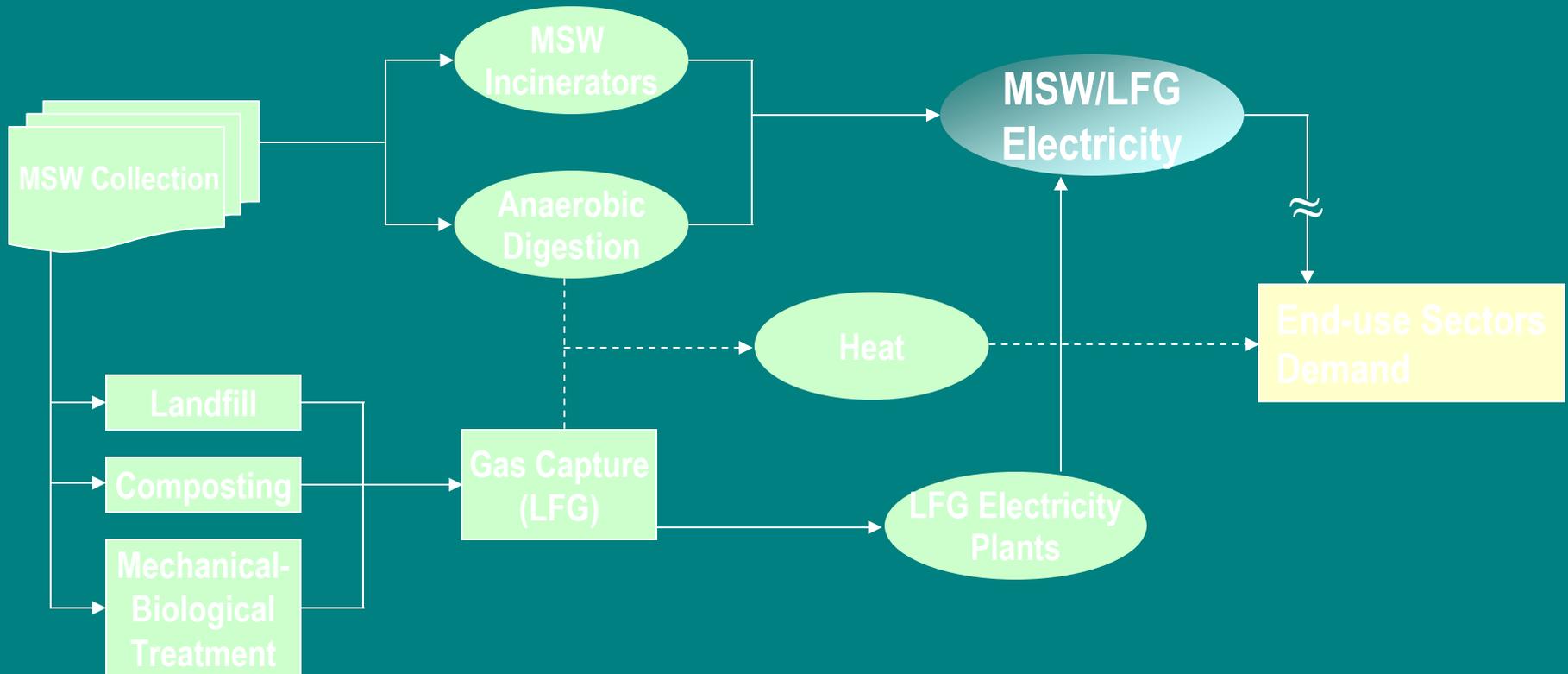
NYC MARKAL – Regional Interactions



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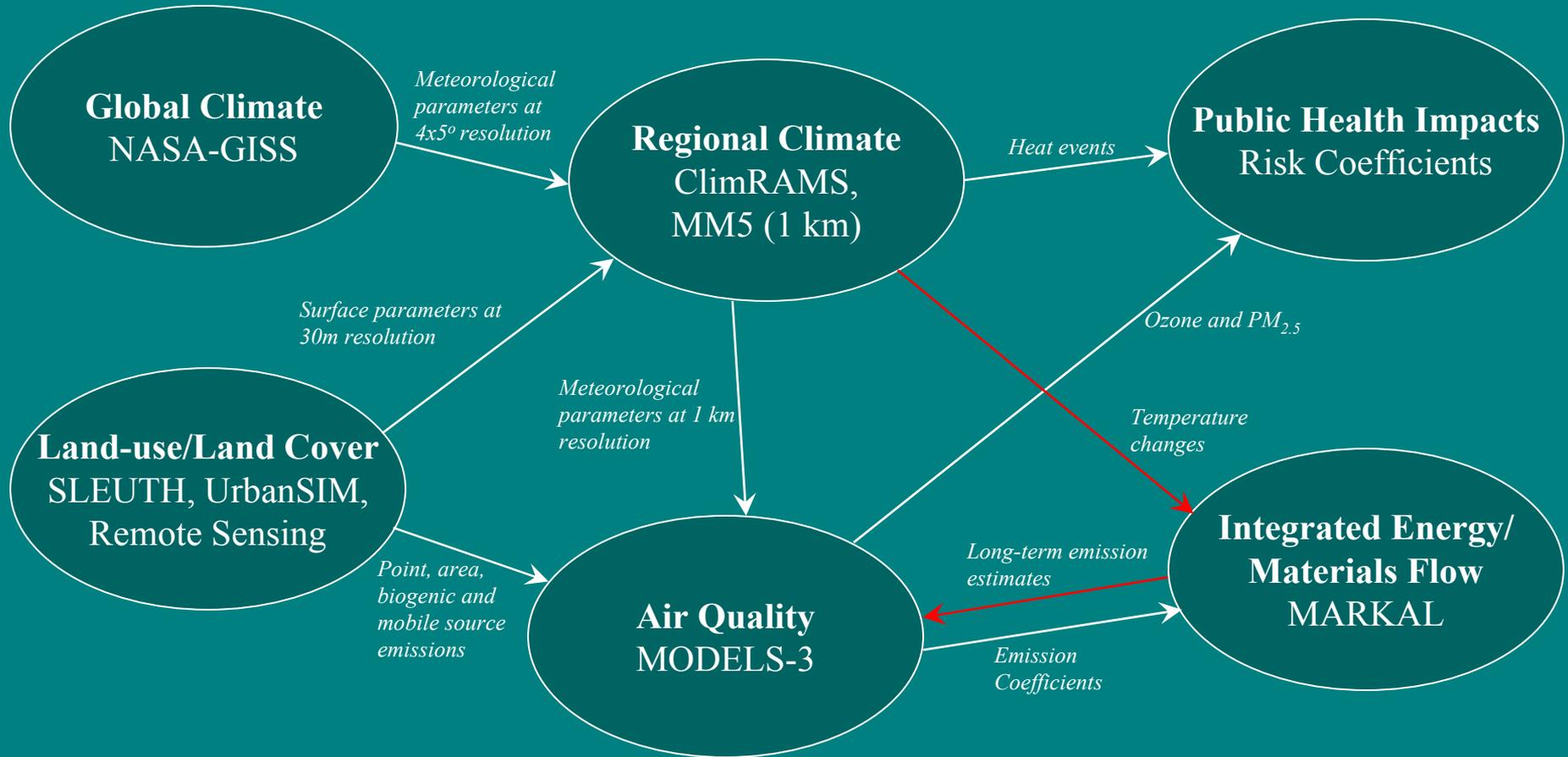
Materials Flow in MARKAL

Municipal Solid Waste



Integrated Modeling Framework

New York City and Greater San Juan Metro Areas



New Spatial Order Linking Technology, Growth, Management, and the Environment

Puerto Rico Integrated MARKAL-Extended Applications

