

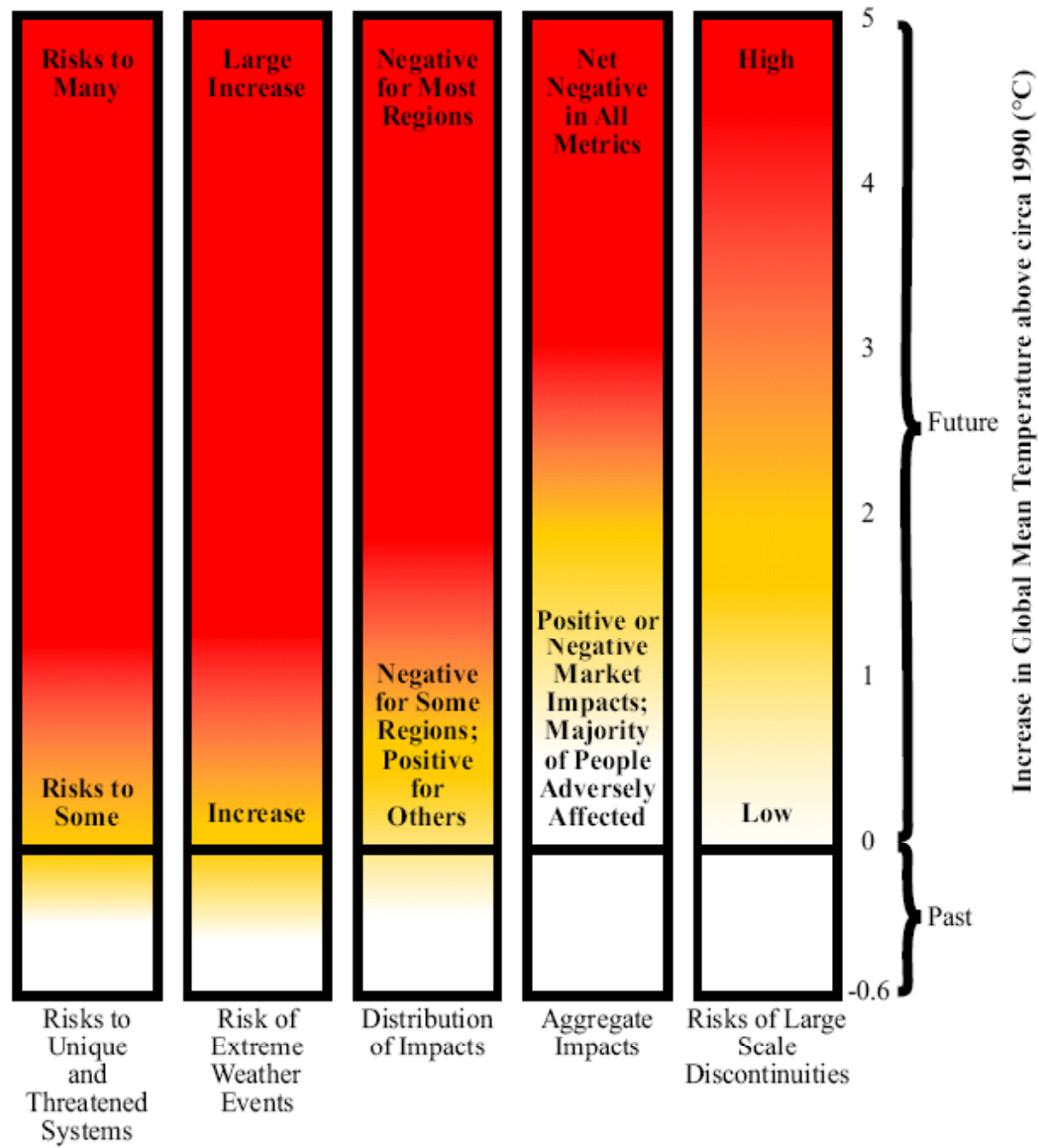
Planning for Climate Change Mitigation

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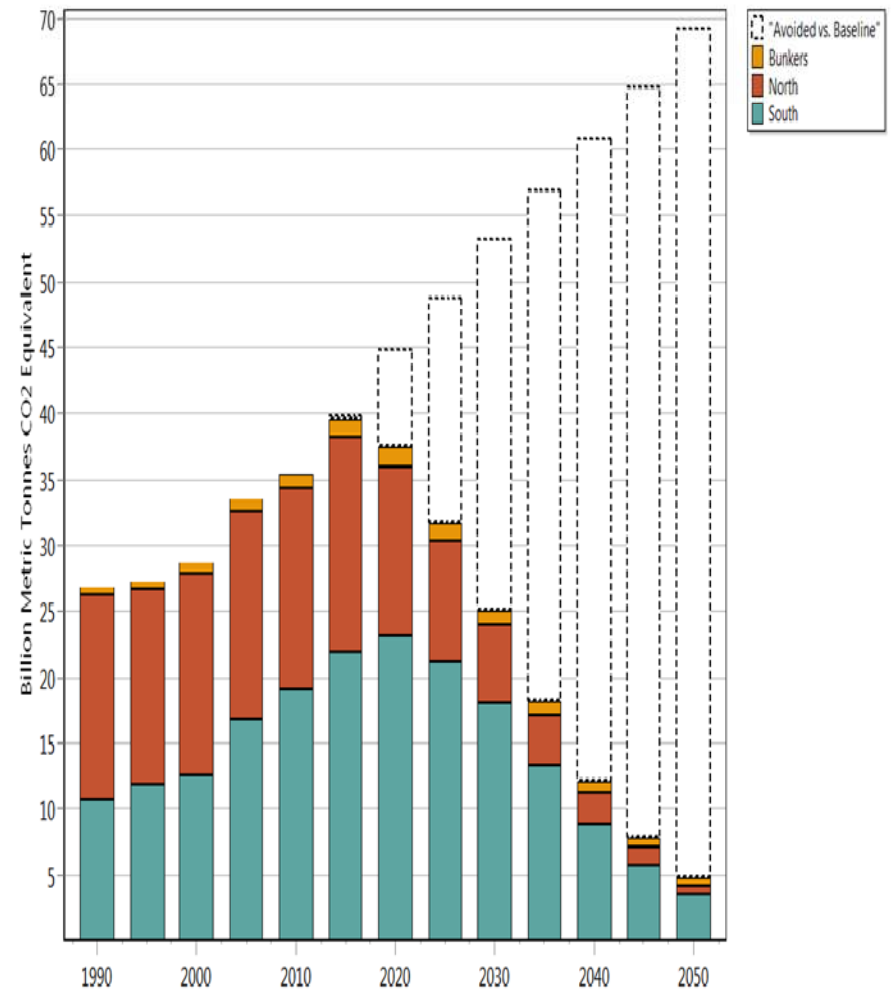
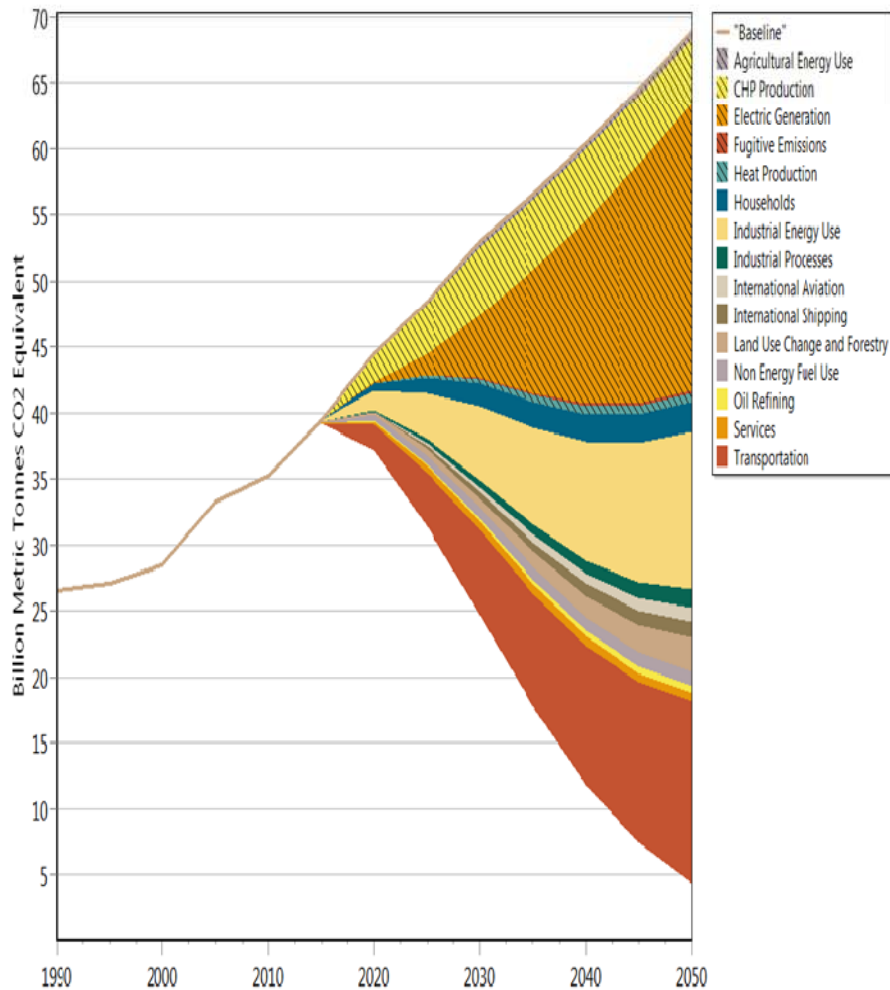
Outline

- The Climate Challenge
- LEAP: SEI's Tool for Climate Mitigation Planning
- Recent Examples
 - Massachusetts: Plan for the 2008 Global Warming Solutions Act.
 - Getting to Zero: A Pathway to a Carbon Neutral Seattle
- Short LEAP Demo

Reasons for Concern



CO₂ Emissions reductions: Baseline vs. Required Climate Action



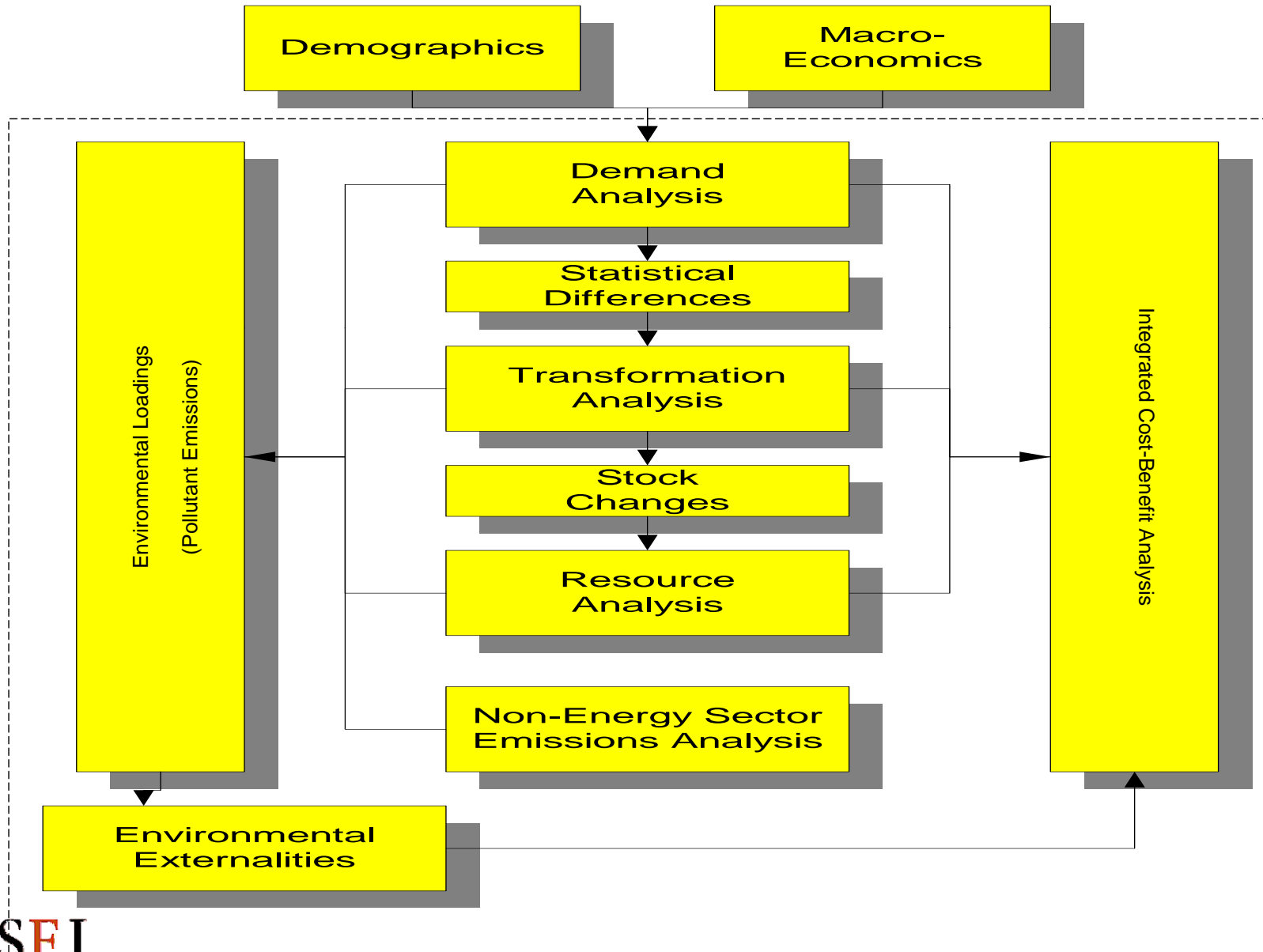


Key Characteristics

- SEI's software for energy planning and GHG mitigation assessment.
- Not a model: a flexible modeling-building tool.
- Local, national, regional and global applicability.
- Broad scope: energy, emissions and cost-benefit calculations, covers all emissions in energy & non-energy sectors.
- Fast calculations, transparent, easy-to-understand reports.
- Mix and match methodologies: e.g. simulation/optimization; engineering/econometrics.
- Powerful data management and reporting (charts, tables, maps, export to MS-Office)
- Medium to long-term.
- Widely applied (1000s of users in 195 countries) and widely cited.
- Used by governments, NGOs, utilities, universities, consulting companies.

Available here: www.energycommunity.org

LEAP Structure



The main menu and toolbar give access to major options.

Data is organized in a tree.

Select scenarios here.

Edit data by typing here.

Switch between views of the Area here.

Select units and scaling factors here.

The screenshot shows the LEAP: Freedonia software interface. The main menu includes Area, View, Analysis, Edit, General, Tree, Chart, Advanced, and Help. The toolbar contains icons for New, Open, Save, Email, Find, Basic Params, Fuels, Effects, Units, References, and Help. The left sidebar has a 'Views' section with icons for Analysis, Results, Diagram, Energy Balance, Summaries, and Overviews. The central tree view shows a hierarchy: Freedonia > Key Assumptions > Demand > Household > Urban. The right panel shows the 'Activity Level' variable selected, with a scenario of 'REF: Reference'. Below this is a table with columns: Name, 2000 Value, Expression, Scale, Units, and Per. The table contains two rows: 'Household' with a value of 8.00 and expression 'Growth(3%)' and 'Urban' with a value of 30.00 and expression 'Interp(2030,45)'. Below the table is a chart titled 'Demand: Activity Level (Million Household)' showing a line graph from 2000 to 2030. The status bar at the bottom indicates '2011.0.0.16 Area: Freedonia Analysis Registered to: charlie.heaps@sei-us.org until: 09/08/2012'.

Name	2000 Value	Expression	Scale	Units	Per
Household	8.00	Growth(3%)	Million	Household	of Ho
Urban	30.00	Interp(2030,45)	Percent	Share	of Ho

The status bar notes the current Area and View.

Data can be reviewed in chart or table format.

LEAP: Status and Dissemination

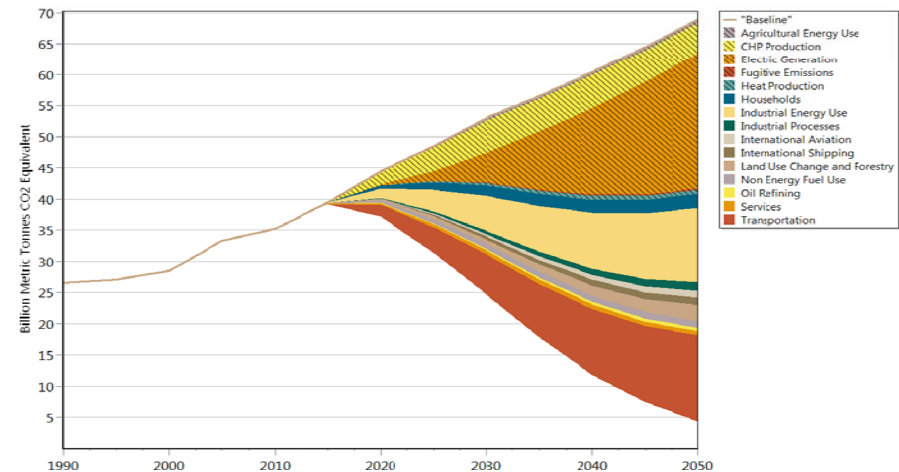
- Available at no charge to non-profit, academic and governmental institutions based in developing countries, and students worldwide.
- License fees for other types of users.
- Download from: www.energycommunity.org
- Technical support from web site or leap@sei-us.org
- User name and password required to fully enable software. Available on completion of license agreement.
- Most users need training: available from SEI and regional partners.
- Check LEAP web site for news of training workshops.



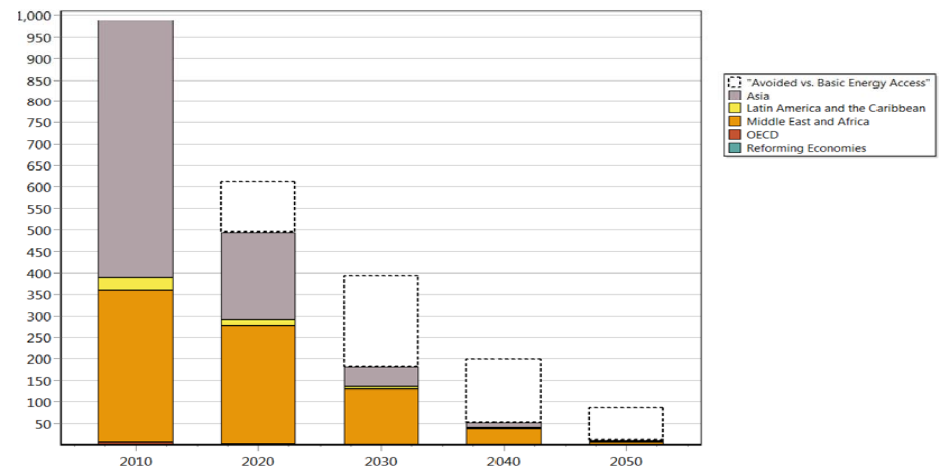
Energy for All: A Global Assessment for Rio+20, 2012

- Explores how global energy systems can be reconfigured to address sustainability whilst also providing meaningful development and poverty alleviation.
- Conducted by SEI with IIASA, PBL, TERI and WRI.
- Energy and emissions scenarios to 2050 developed in LEAP for 20 global regions.
- Three scenarios:
 - Baseline
 - Basic Energy Access
 - Shared Development Agenda
- Report to be published at Rio+20
- Will also result in new open source, freely accessible global data set for LEAP.

Emissions



Poverty

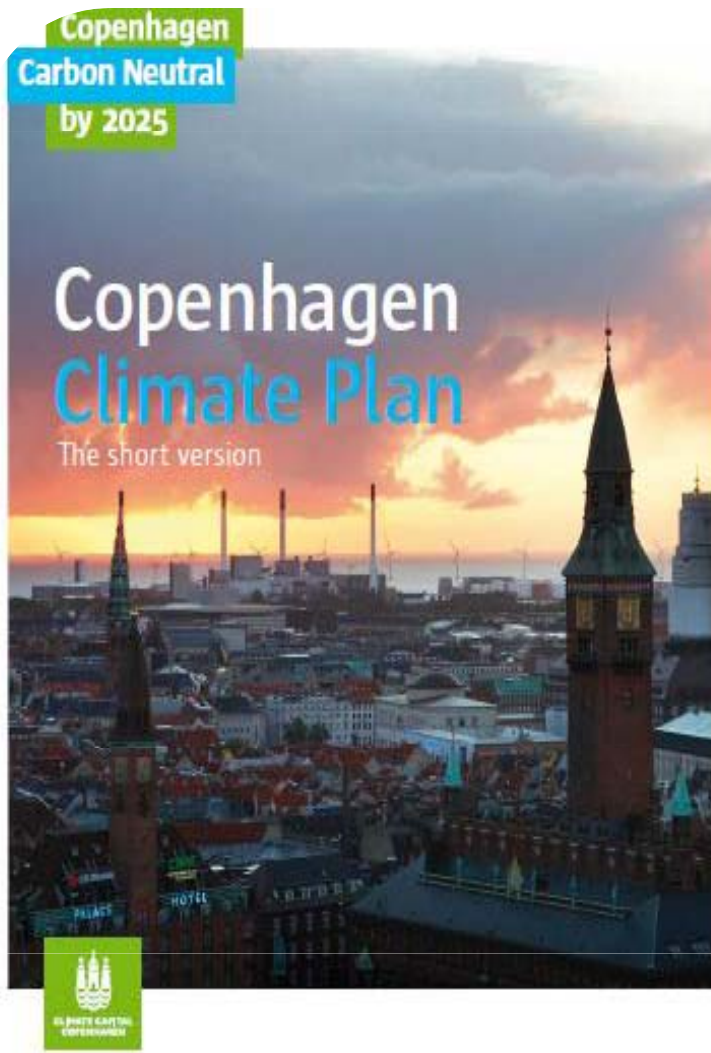


Europe's Share of the Climate Challenge, 2009

- Joint project of SEI and Friends of the Earth International, presented at COP15 in Copenhagen and at the European Parliament in 2010.
- Uses LEAP to create a detailed sector-by-sector mitigation scenario for all 27 EU countries that examines how to achieve GHG reductions of
 - 40% in 2020 and
 - close to 90% in 2050 vs. 1990 levels.
- Examines radical improvements in energy efficiency, accelerated retirement of fossil fuels and a dramatic shift toward renewables.
- Also examines the role of sufficiency and greater equity among EU nations in helping promote a transition to a low GHG future.
- www.ClimateShareEurope.org



Copenhagen Climate Plan, 2009



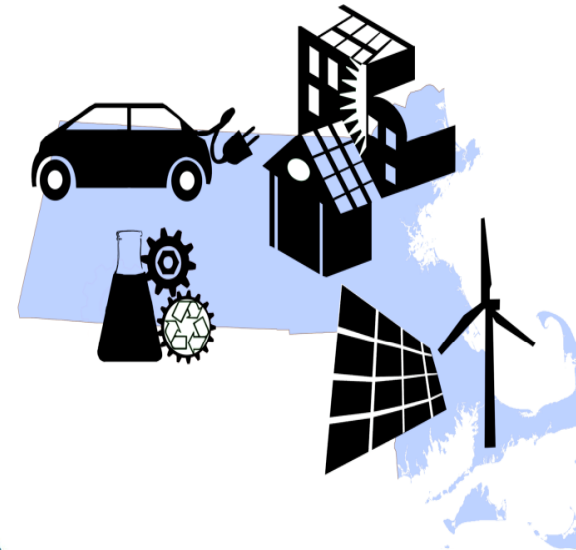
- The Consulting Company RAMBOLL used LEAP to prepare a plan for the city of Copenhagen to become CO2 neutral by 2025.
- Copenhagen is already perhaps the most energy efficient city in the World, in part due to its widespread use of CHP systems for district heating and huge investments in wind power, and because nearly 40% of its citizens cycle to work or school every day.
- This study formed the basis for Copenhagen setting a target of 20% reduction in CO2 emissions by 2015 compared to 2005 and becoming completely CO2 neutral by 2025.



The Massachusetts Clean Energy and Climate Plan (CECP)

- The Global Warming Solutions Act (GWSA) requires MA to achieve GHG reductions of -25% by 2020 and -80% by 2050 vs. 1990.
- Team lead by Eastern Research Group (ERG) asked to develop an analysis of how to meet 2020 and 2050 goals.
- SEI acted as integrator of sectoral assessments: using its LEAP model to create a portfolio of options capable of meeting the 2020 and 2050 goals.
- For 2050, 40+ policies examined including policies addressing system and end-use efficiency, electrification, low carbon fuels and lifestyles.
- Results used to inform the CECP: the State Government's 2010 Initial Response to the 2008 GWSA.

Massachusetts Clean Energy and Climate Plan for 2020



Executive Office of Energy and Environmental Affairs



tinyurl.com/CECPMass

Policies for 25% Reductions in 2020

- Buildings
 - All cost-effective energy efficiency
 - Advanced building energy codes
 - Building energy rating and labeling
 - “Deep” energy efficiency improvements for buildings
 - Expanding energy efficiency programs to heating oil
 - Developing markets for solar thermal water/space heating
 - Tree retention and planting
 - Federal appliance and product standards
- Energy Supply
 - Renewable Portfolio Standard
 - More stringent EPA power plant rules
 - Clean energy imports
 - Clean energy performance standards
- Non-energy Emissions
 - Reducing GHG emissions from motor vehicle air conditioning
 - Refrigerant management
 - Reducing SF6 emissions from switchgear
 - Reducing GHG emissions from plastics
- Transportation
 - Federal and California vehicle efficiency and GHG standards
 - Federal emissions and fuel efficiency standards for medium/heavy vehicles
 - Federal renewable fuel standard and regional low carbon fuel standard
 - Clean car consumer incentives
 - Pay As You Drive (PAYD) auto insurance
 - GreenDOT: comprehensive sustainability initiative for Transport
 - Smart growth policy package
- Cross-Cutting Policies
 - MEPA GHG policy and protocol
 - Leading by Example
 - Green Communities Division
 - Consideration of GHGs in State permitting, licensing and administrative approvals

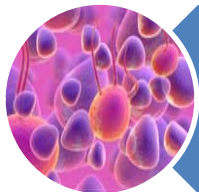
2050 Future Scenarios



Efficiency



Electrification



Low-Carbon Fuels



Lifestyles

Top Options for 2050

#	Option	Sector	Type	CO2 Reductions	Likely Cost
1	Electric Vehicles	Transportation	Technical	Very Large	High
2	Efficient Vehicles	Transportation	Technical	Very Large	Medium
3	Near Zero CO2 Electric Generation	Supply	Technical	Very Large	High
4	Deep Retrofits of Existing Housing	Residential	Technical	Very Large	High
5	Smaller Cars	Transportation	Behavioral	Large	Negative
6	Low CO2 2nd Generation Biofuels	Supply	Technical	Large	Medium
7	Eliminate ODS Substitute Emissions	Non Energy	Technical	Large	Low
8	Forest Sequestration	Non Energy	Technical	Large	Low
9	Industrial Energy Efficiency	Industry	Technical	Large	Medium
10	Deep Retrofit Commercial Buildings	Commercial	Technical	Large	High
11	Low Energy New Commercial Buildings	Commercial	Technical	Large	Low
12	Commercial Oil Phase-out	Commercial	Technical	Large	Low
13	Commercial Lighting Efficiency	Commercial	Technical	Large	Low
14	"Smart Growth"	Transportation	Technical	Medium	Negative
15	Car Pooling	Transportation	Behavioral	Medium	Low
16	Biofuels for Road Freight	Transportation	Technical	Medium	Medium
17	Switch From Trucks to Cars	Transportation	Behavioral	Medium	Negative
18	Biofuels for Cars and Light Trucks	Transportation	Technical	Medium	Low
19	Reduce Air Travel Growth	Transportation	Behavioral	Medium	Low
20	Smaller Housing	Residential	Behavioral	Medium	Negative
21	Efficient New Housing	Residential	Technical	Medium	Low
22	Residential Oil Phase-out	Residential	Technical	Medium	Low

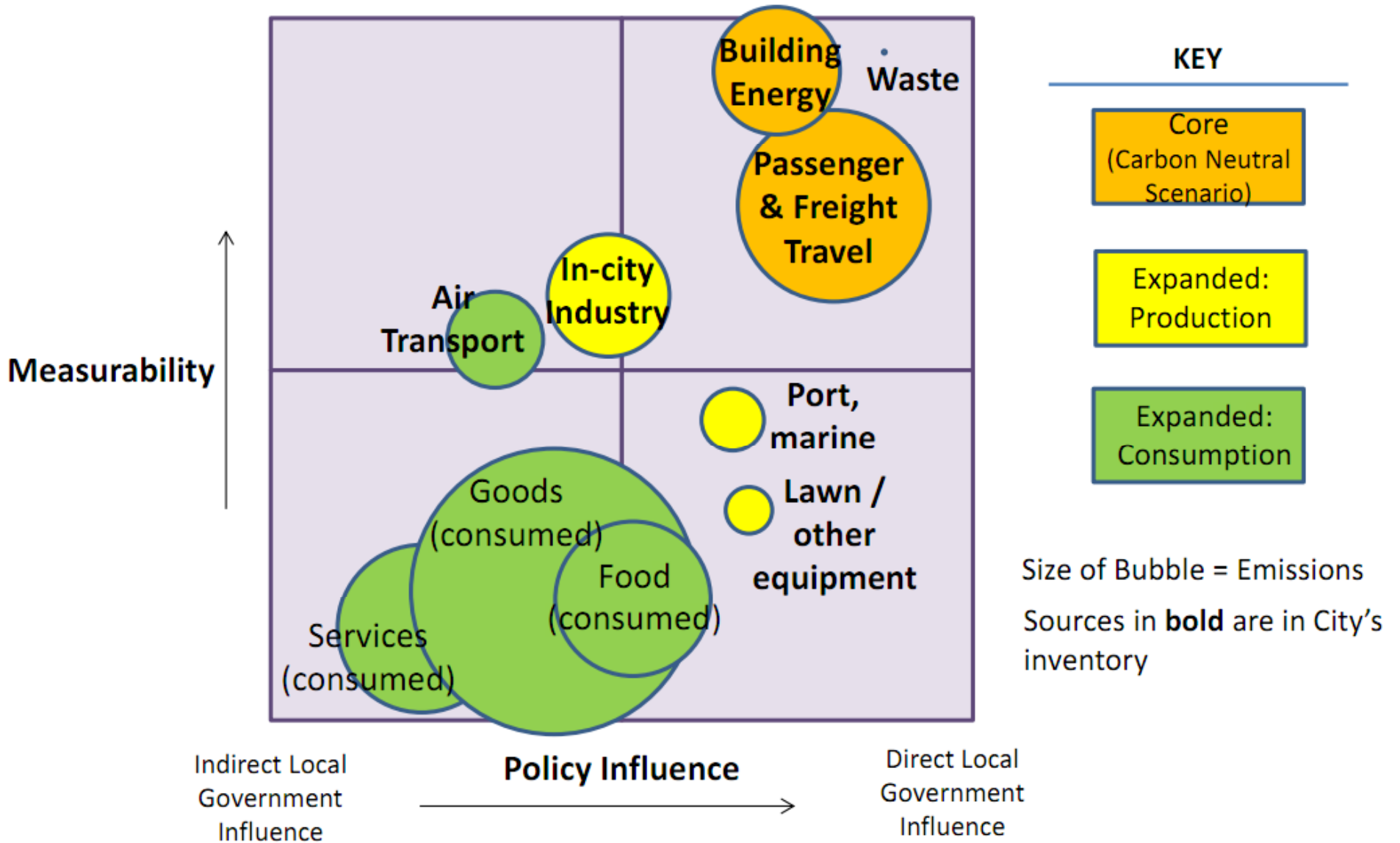
More Options for 2050

#	Option	Sector	Type	CO2 Reductions	Likely Cost
22	Residential Oil Phase-out	Residential	Technical	Medium	Low
23	Solid Waste Management	Non Energy	Technical	Medium	Low
24	Healthy Diets	Non Energy	Behavioral	Medium	Negative
25	Commercial Fridge-Freezers	Commercial	Technical	Medium	Low
26	Improve Transit Load Factors	Transportation	Technical	Small	Low
27	Increase Transit Service	Transportation	Technical	Small	High
28	Biofuels for Aircraft	Transportation	Technical	Small	Medium
29	Residential Dryer Use Reduction	Residential	Technical	Small	Negative
30	Residential Dryer Efficiency	Residential	Technical	Small	Medium
31	Residential Fridge-Freezers	Residential	Technical	Small	Low
32	Residential TV Efficiency	Residential	Technical	Small	Low
33	Residential Lighting	Residential	Technical	Small	Low
34	Residential Cooking	Residential	Technical	Small	Low
35	Other Residential Efficiency	Residential	Technical	Small	Low
36	Commercial Office Equipment	Commercial	Technical	Small	Low
37	Switch N.E. Corridor Air to Rail	Transportation	Technical	Very Small	High
38	Electrify Commuter Rail	Transportation	Technical	Very Small	Medium
39	Electric Buses	Transportation	Technical	Very Small	Medium
40	Biofuel Buses	Transportation	Technical	Very Small	Low
41	Electrify Intercity Rail	Transportation	Technical	Very Small	Low
42	Residential biofuels	Residential	Technical	Very Small	Low
43	Commercial Biofuels	Commercial	Technical	Very Small	Low

Getting to Zero: A Pathway to a Carbon Neutral Seattle

- 2010: Seattle City Council adopts vision of becoming nation's first carbon-neutral city.
- The Seattle Office of Sustainability and Environment (OSE) asks SEI, Cascadia Consulting and ICF to develop a scenario showing how this might be achieved.
- Scenario published in May 2011 reflects ambitious but plausible strategies.
- In October 2011, Seattle City Council adopts zero net emissions by 2050 as the goal for its Climate Action Plan and begins to develop a detailed Climate Action Plan.
- See: www.seattle.gov/environment/climate_plan.htm
- Report: tinyurl.com/SeattleZeroReport

Focus on “Core” emissions



Key Strategies

- **Increasing Energy Efficiency in Buildings**
 - 30% energy savings by 2030, 50% by 2050, relative to baseline
 - Passive design levels in all new buildings by 2030
 - Deep Building Retrofits (90% of buildings reached by 2050)
 - Electric heat pumps
 - Renewable district heat (commercial and new multi-family) replaces gas and oil for space and water heat
- **Reducing vehicle travel and mode switching**
 - Light duty vehicle travel down 27% by 2030 and 33% by 2050 relative to baseline
 - Increased Transit
 - Better Land Use & Compact Development
 - VMT Pricing
 - Pay as You Drive Insurance
 - Increased Parking Fees
 - Improved Bicycle/Pedestrian infrastructure
 - Trip reduction
- **Low Carbon Fuels and Electricity**
 - Oil declines from 50% of energy use today to 3% by 2050; Natural gas from 17% to 12%
 - Electricity increases from 30% of mix today to 53% by 2050
 - Advanced biofuels key role in meeting remaining liquid/gas fueled needs.
 - Electricity remains below baseline levels, due to efficiency gains.
 - NB: Seattle already has C-free electricity supply (hydro).
- **Waste**
 - Increased waste diversion
 - Improved landfill gas capture
 - Generation of biogas from organic waste