Greenhouse Gas and Climate Change Impact Analysis

ICF Jones & Stokes
an ICF International Company

Placer County Air Pollution Control District
August 26, 2009

AGENDA

- Introduction
- Greenhouse Gas and Climate Change Basics
- Regulatory Framework and CEQA
- Q & A
- Break
- GHG Quantification, Thresholds and Mitigation
- Q & A
- Break
- Lunch
  - Guest Speaker: *Professor Robert Christopherson*

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Unit 1
Introduction to Greenhouse Gas and Climate Change Impact Assessment

Rich Walter, Principal
ICF Jones & Stokes

Presented at the PCAPCD Climate Change Workshop

August 26, 2009

The Changing "Climate" for Climate Change

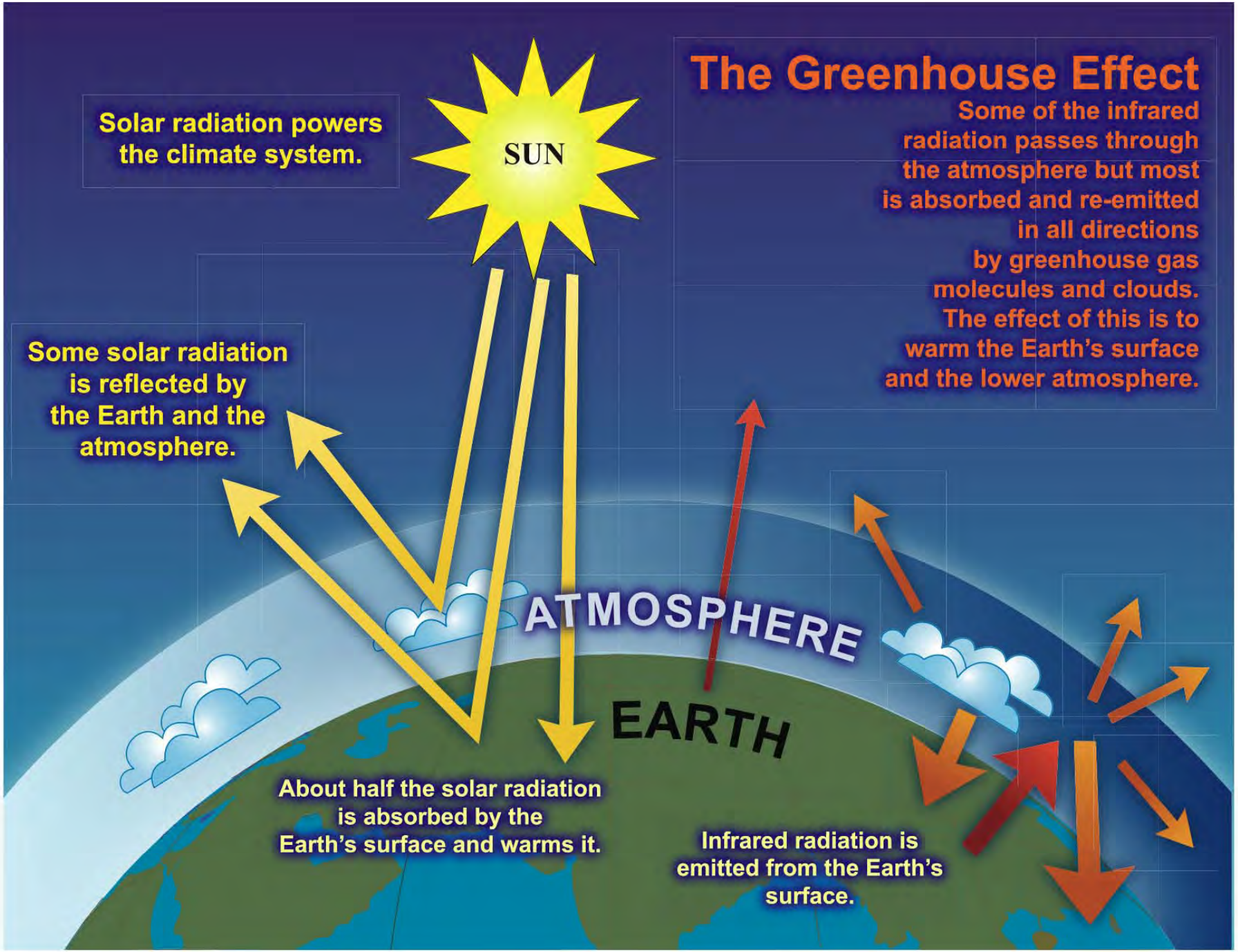
- "It is the sense of the scientific community that carbon dioxide from unrestrained combustion of fossil fuels potentially is the most important environmental issue facing mankind"
- Source: Department of Energy
- April 2, 1979

Climate Change

- Global Warming – An increase in GHG emissions leads to an increase in average global temperature
- Climate Change – as a consequence of global warming, our climate is expected to change due to changes in weather patterns, average sea level, ocean acidification, changes chemical reaction rates, changes precipitation rates, etc.

Greenhouse Effect is due to Greenhouse Gasses

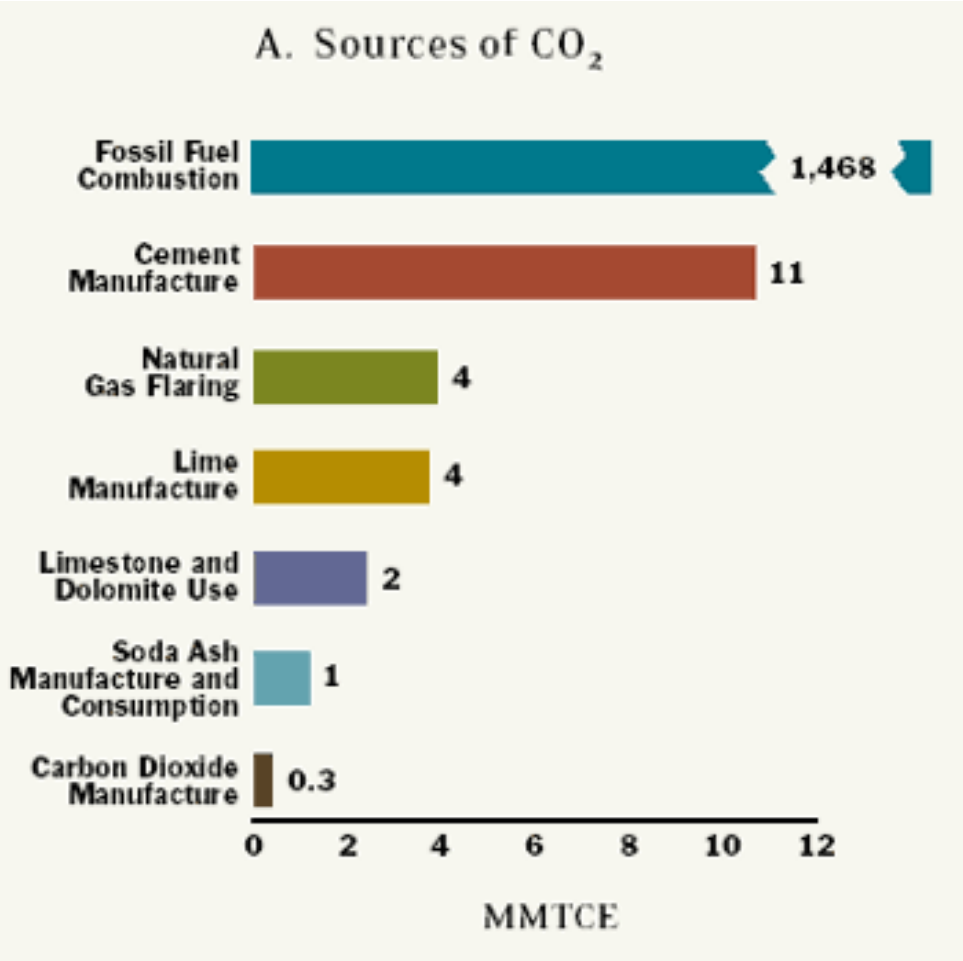
- Without the effect, our planet would not be inhabitable by humans
- GHG gasses are those that absorb infrared radiation in the spectrum emitted by our Earth
- GHG gasses can be emitted by natural processes (e.g. volcanoes) or from anthropogenic sources (those due to man)

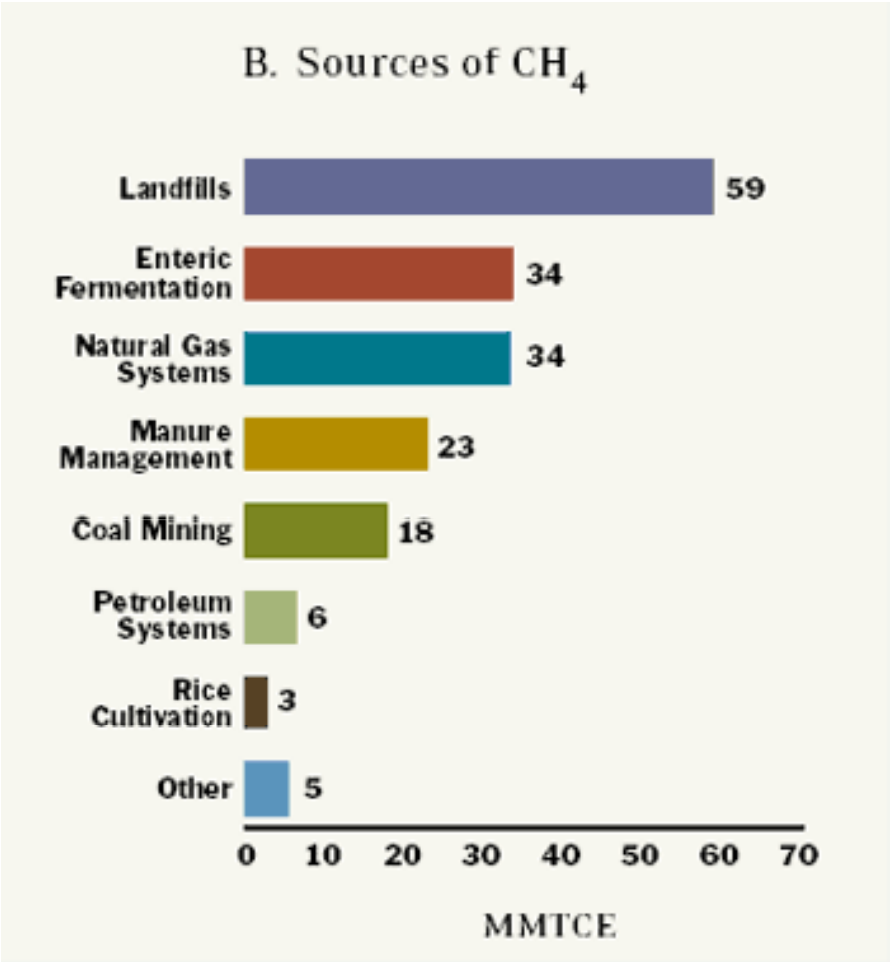

The Greenhouse Effect
Solar radiation powers the climate system.
SUN
Some of the infrared radiation passes through the atmosphere but most is absorbed and re-emitted in all directions by greenhouse gas molecules and clouds. The effect of this is to warm the Earth's surface and the lower atmosphere.
Some solar radiation is reflected by the Earth and the atmosphere.
ATMOSPHERE
EARTH
About half the solar radiation is absorbed by the Earth's surface and warms it.
Infrared radiation is emitted from the Earth's surface.

The Most Important GHGs

- Carbon Dioxide (CO_2)
- Methane (CH_4)
- Nitrous Oxide (N_2O)
- Hydrofluorocarbons (HFC)
- Perfluorocarbons (PFC)
- Sulfur hexafluoride (SF_6)
- Water (H_2O)
- Ozone (O_3)

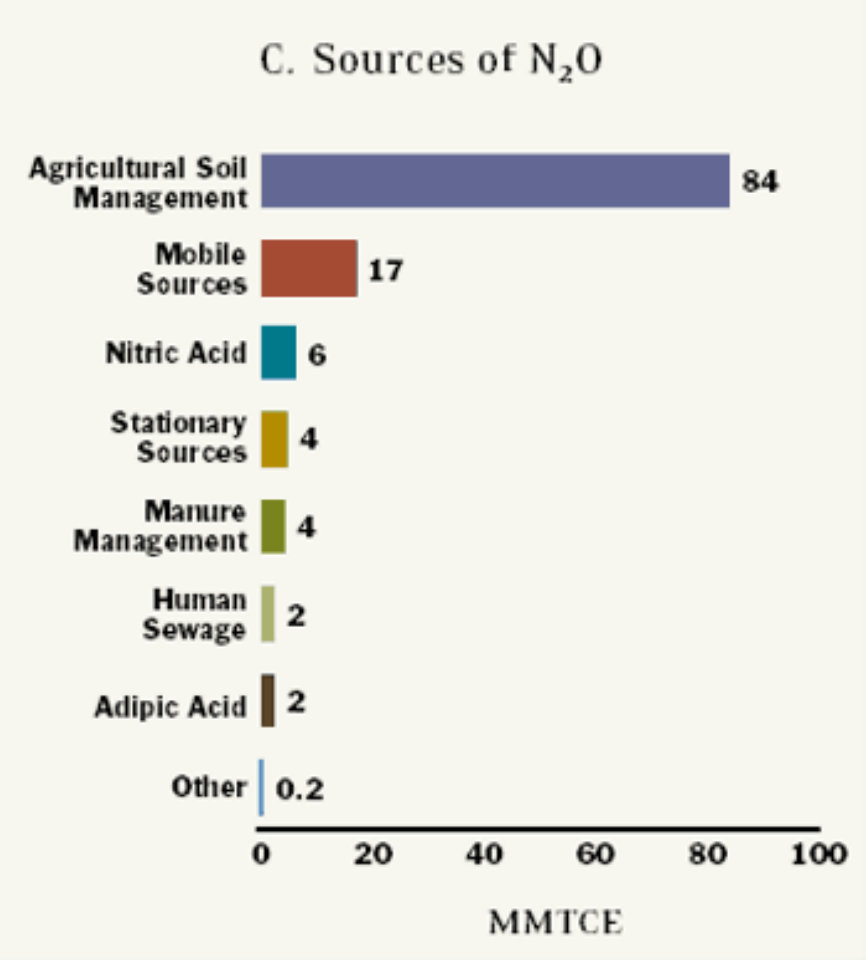
Sources of CO2 and CH4

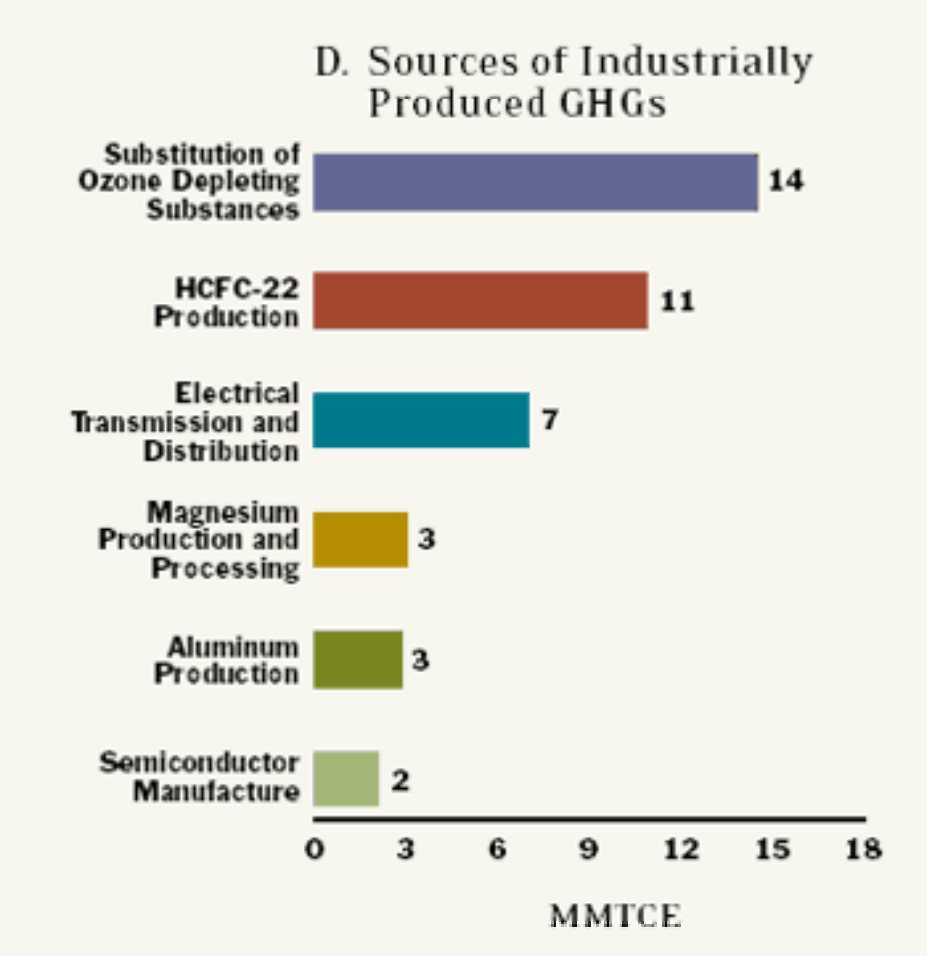




Source: Pew Center on Global Climate Change

Sources of N20 and HGW Potential GHGs





Source: Pew Center on Global Climate Change

Describing the Complex Soup of GHGs

- Each GHG has different chemical reactivity & lifetimes
- Commonly combine all GHG emissions into the equivalent emissions of carbon dioxide (CO_{2E})
- Normalization process requires the specification of the Global Warming Potential (GWP) of each gas and the evaluation timeframe (use 100 years in general)

Global Warming Potentials

GWP values and lifetimes from IPCC TAR				
Gas	**Lifetime (years)**	**GWP Time horizon**		
		20 years	100 years	500 year
Methane	12	62	23	7
Nitrous oxide	114	275	296	156
HFC -134a (hydrofluorocarbon)	13.8	3,300	1300	400
HFC -23 (hydrofluorocarbon)	260	9,400	12,000	10,000
sulfur hexafluoride	3,200	15,100	22,200	32,400
Carbon Dioxide	50-200	1	1	1

Carbon Equivalent/CO_{2E} – Units

- Inventories are based on annual emissions
- State GHG inventories are in MMT/year (million metric tons of CO_{2E})
  (1 metric ton=1000 kg)
- 1 MMT = ~ 215,000 passenger cars
- 1 car at 20 miles/gal @ 10,000 miles/year =
  ~5 tons CO_{2E}/year

Intergovernmental Panel on Climate Change (IPCC)

- IPCC is the scientific body tasked to evaluate the risk of climate change caused by human activity.
- Created in 1988 by two UN organizations
  - World Meteorological Organization (WMO) & the
  - United Nations Environment Programme (UNEP)
- Does not carry out research or monitoring, rather it distills pier reviewed literature on CC and periodically creates special reports
- Widely considered the authoritative body on CC
- Creates summaries for policymakers and scientists

IPCC 2007 Findings

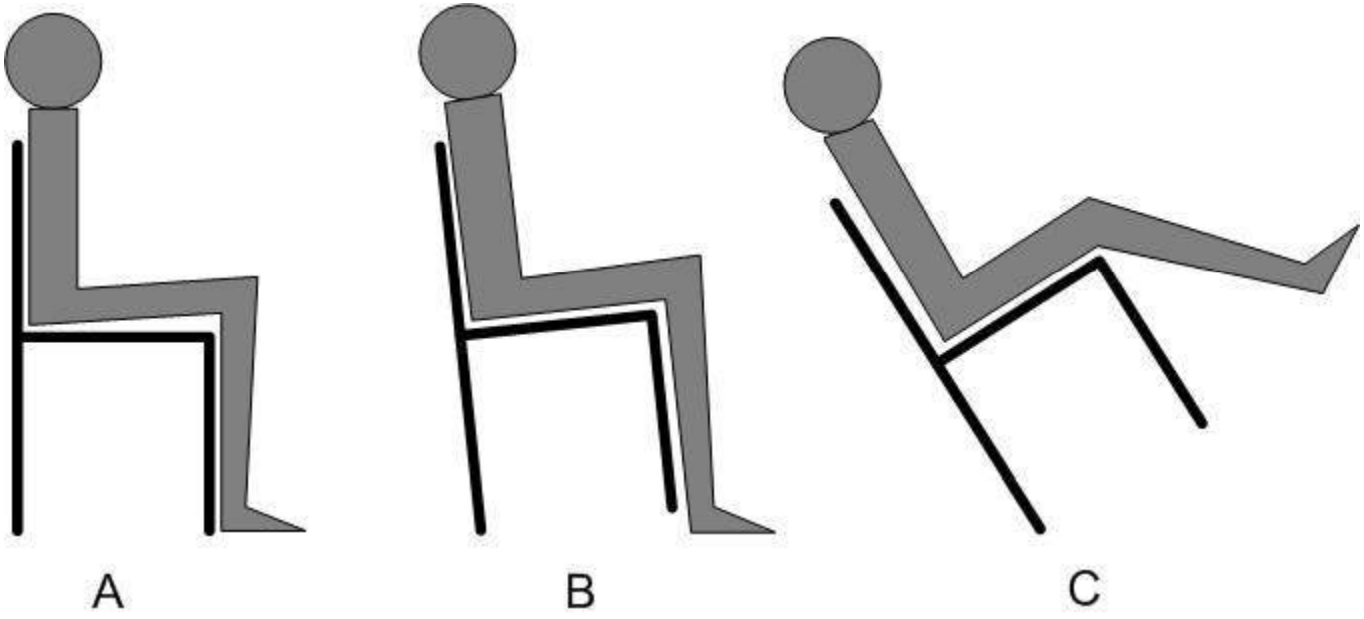
- Warming of the climate system is unequivocal.
- The probability that this is caused by natural climatic processes alone is less than 5%.
- World temperatures could rise by between 1.1 and 6.4 °C (2.0 and 11.5 °F) during the 21st century (table 3) and that:
- Sea levels will probably rise by 18 to 59 cm (7.08 to 23.22 in)

Feedback loops

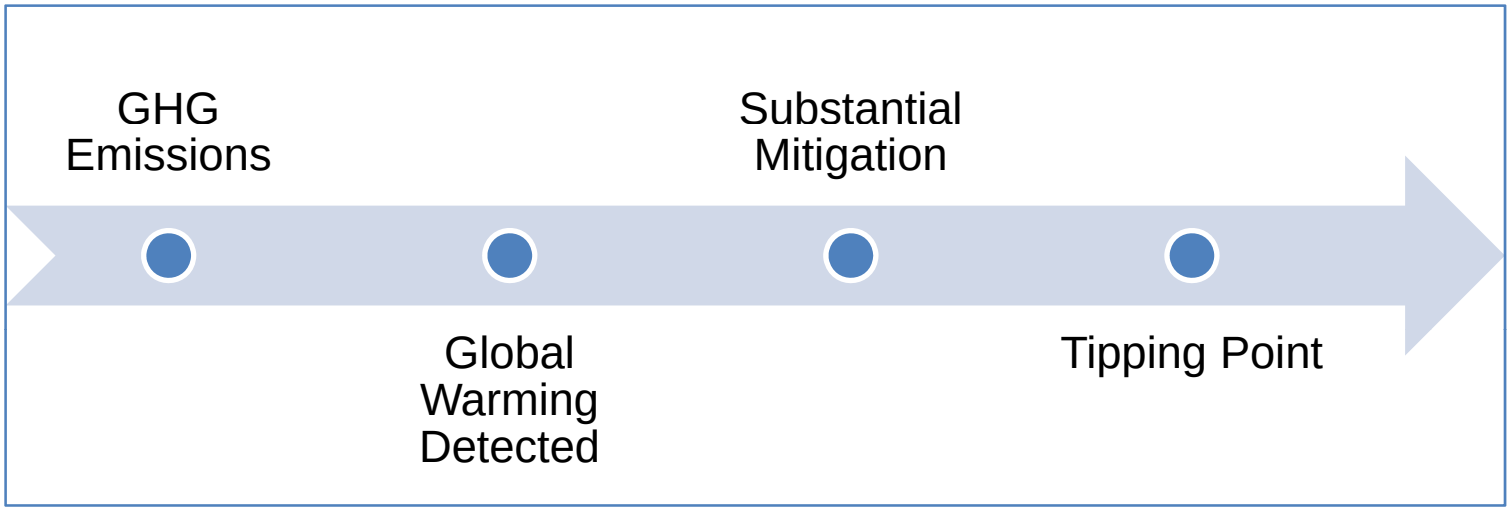
- Feedback loop – output of process is fed back into the input. Can be negative or positive.
- Negative feedback is self regulating
  - more heat -> more cloud cover
- Positive feedback can go out of control
  - Ice melting will reduce reflectivity of earth increasing

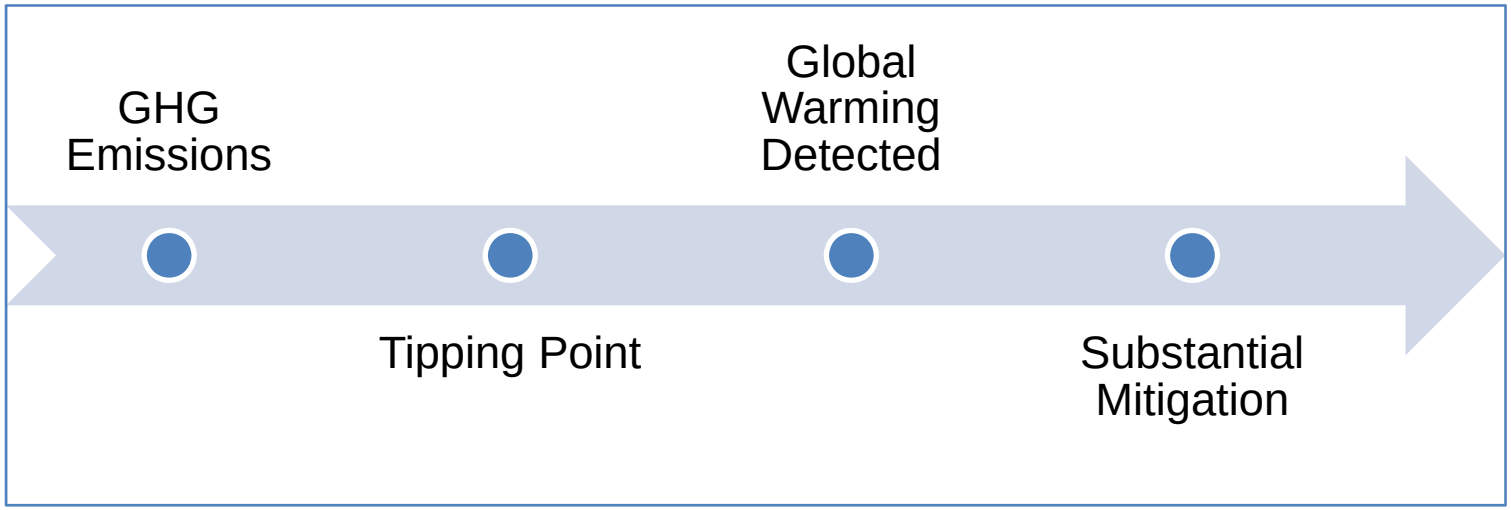
Tipping Points

- Tipping Point - the levels at which the momentum for change becomes unstoppable

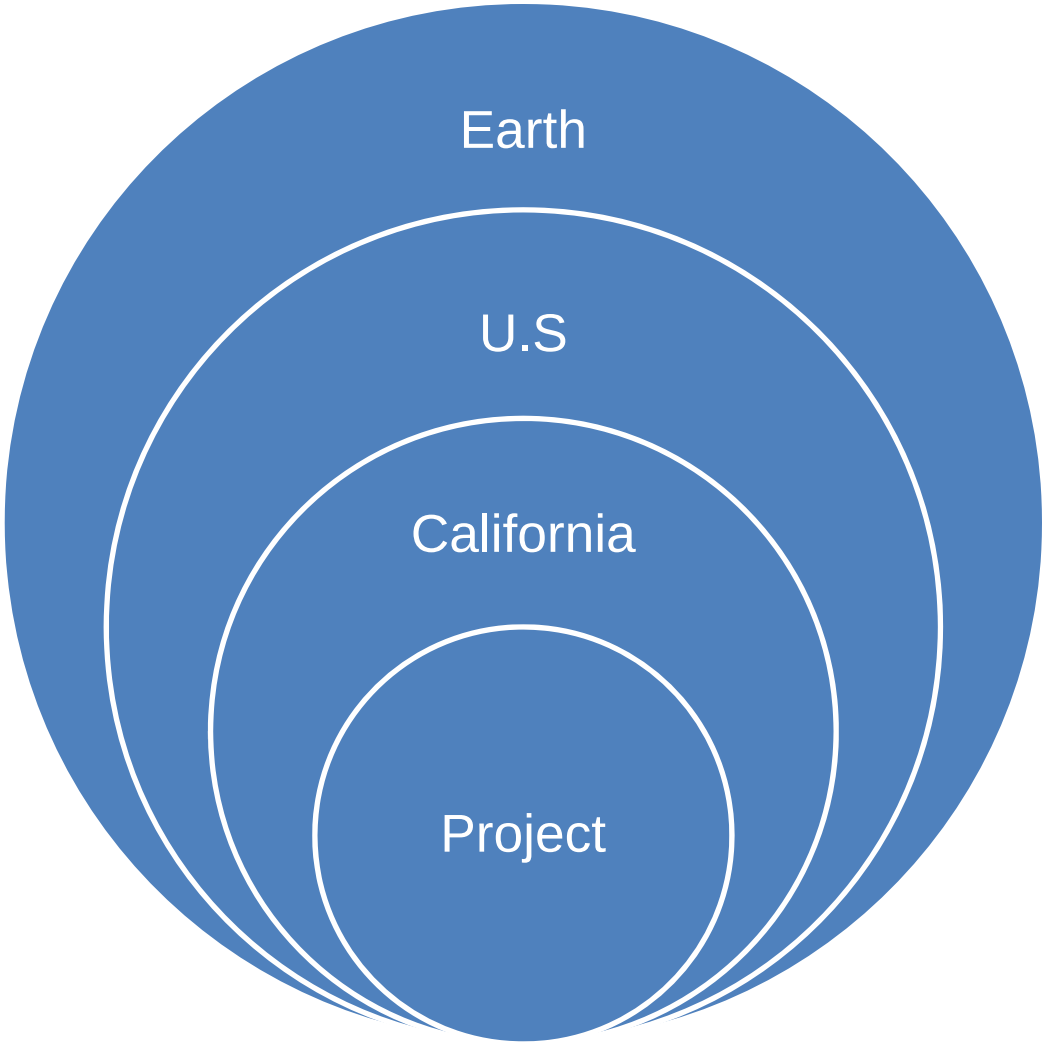


Tipping Points Scenarios

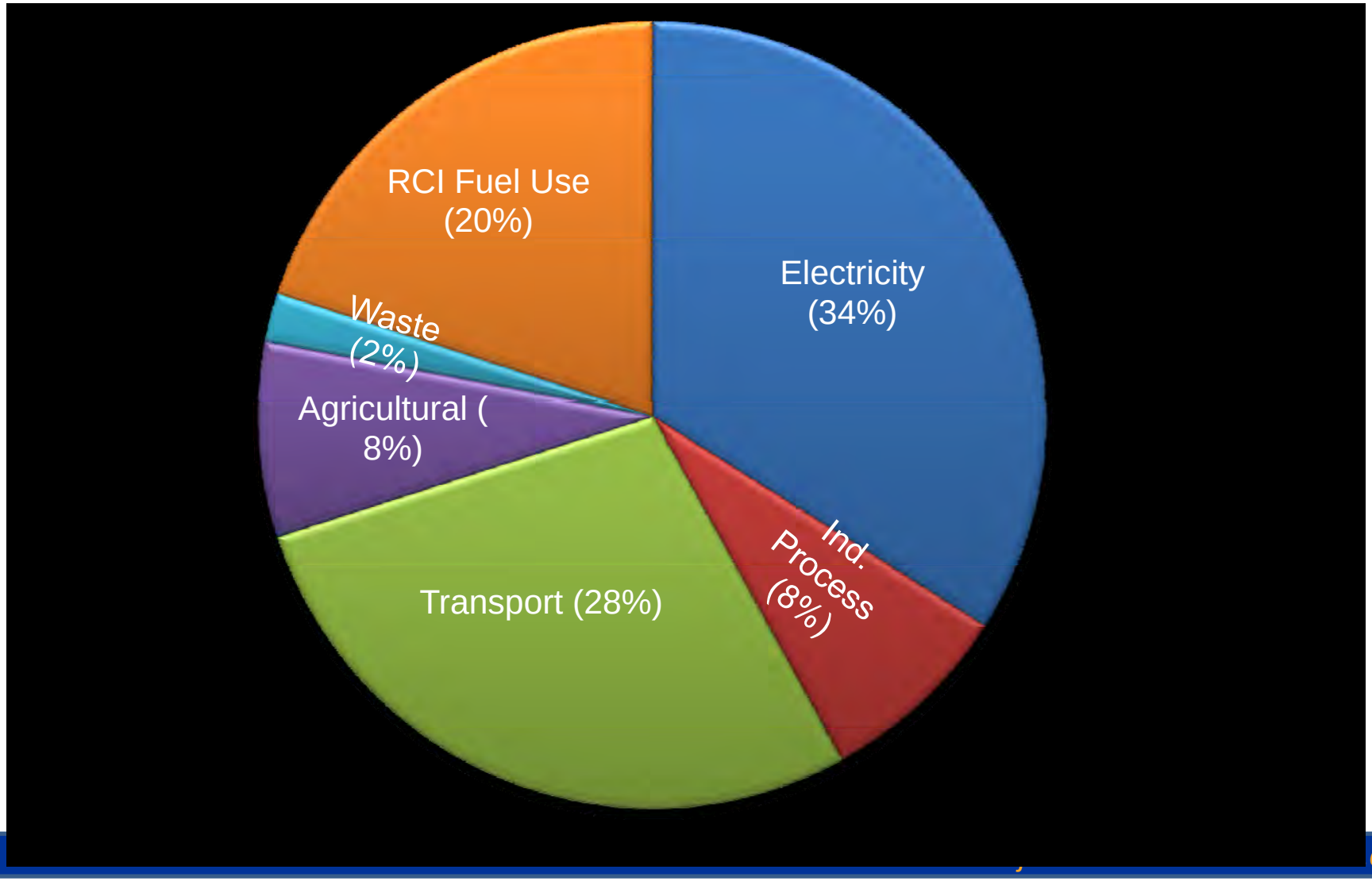




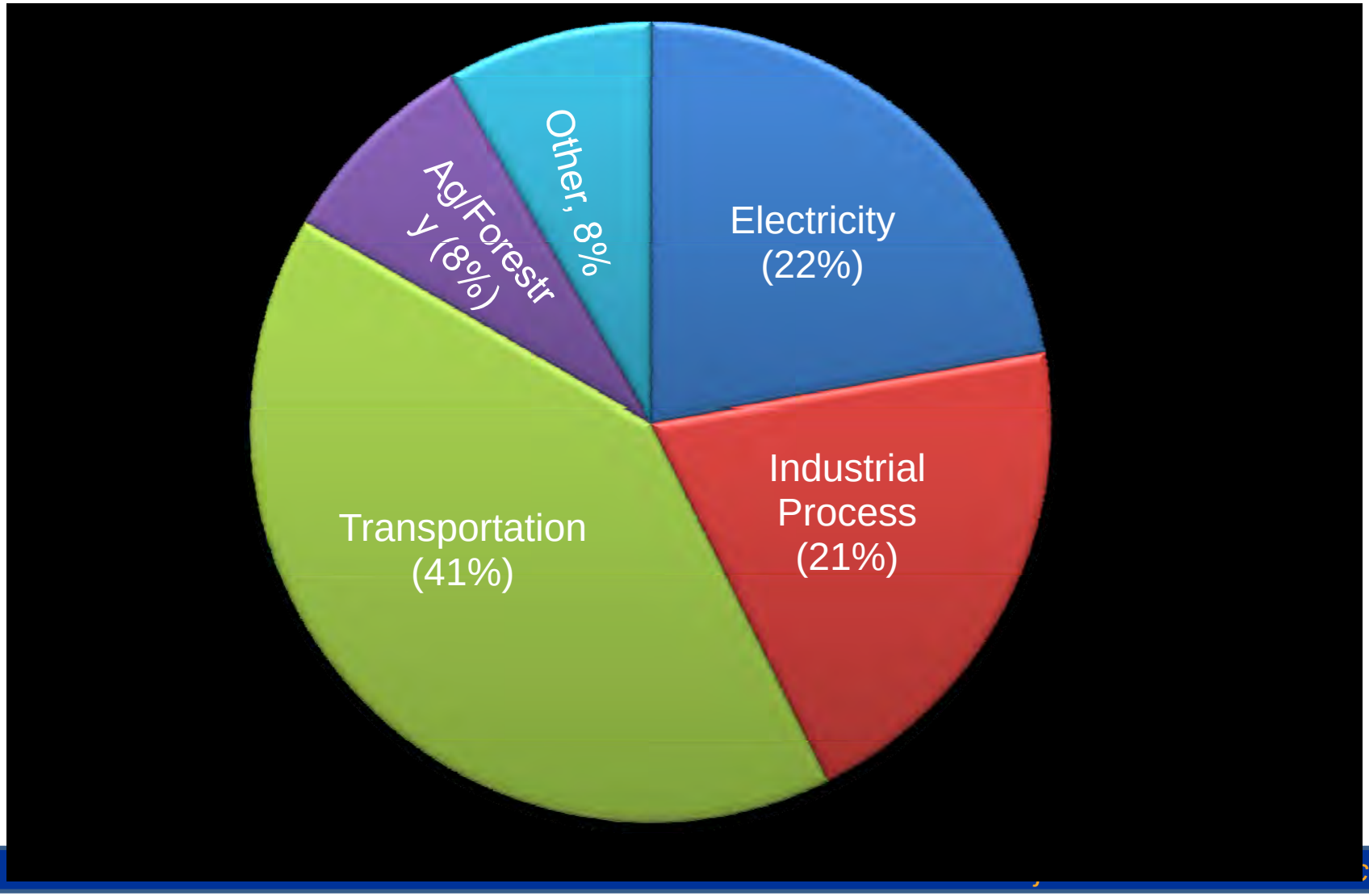
Scales of Measurement

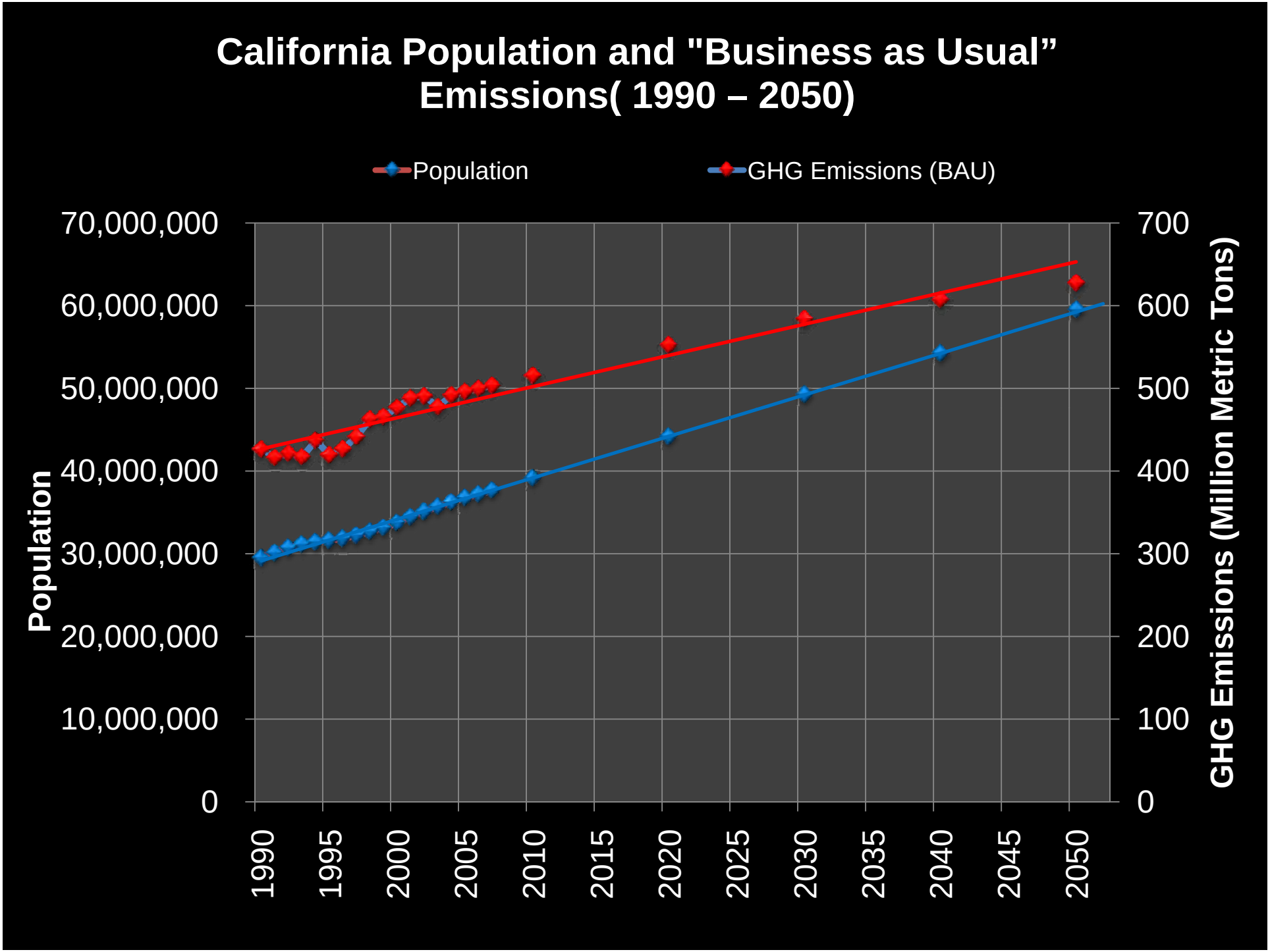


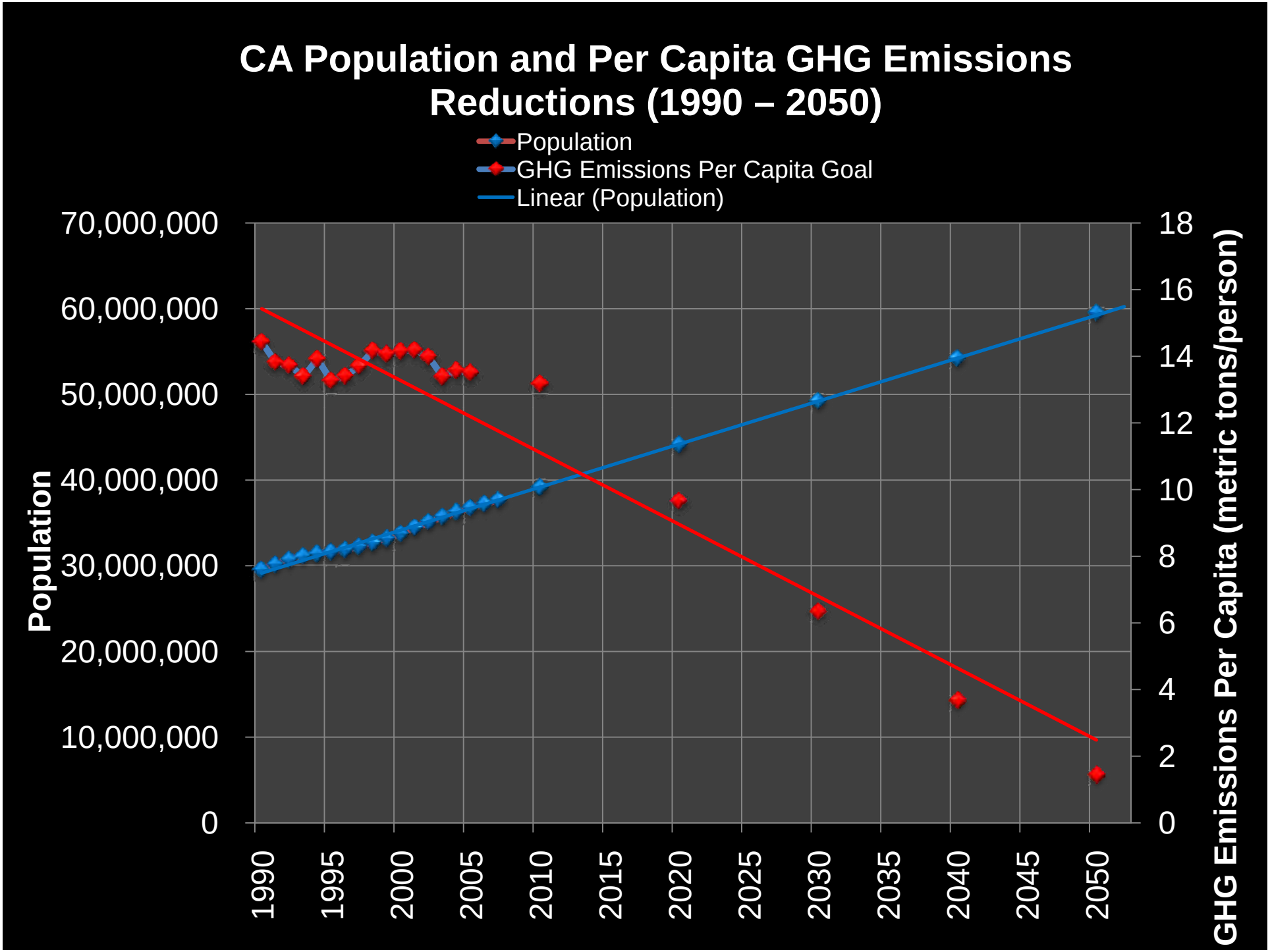
U.S. GHG Emissions by Sector



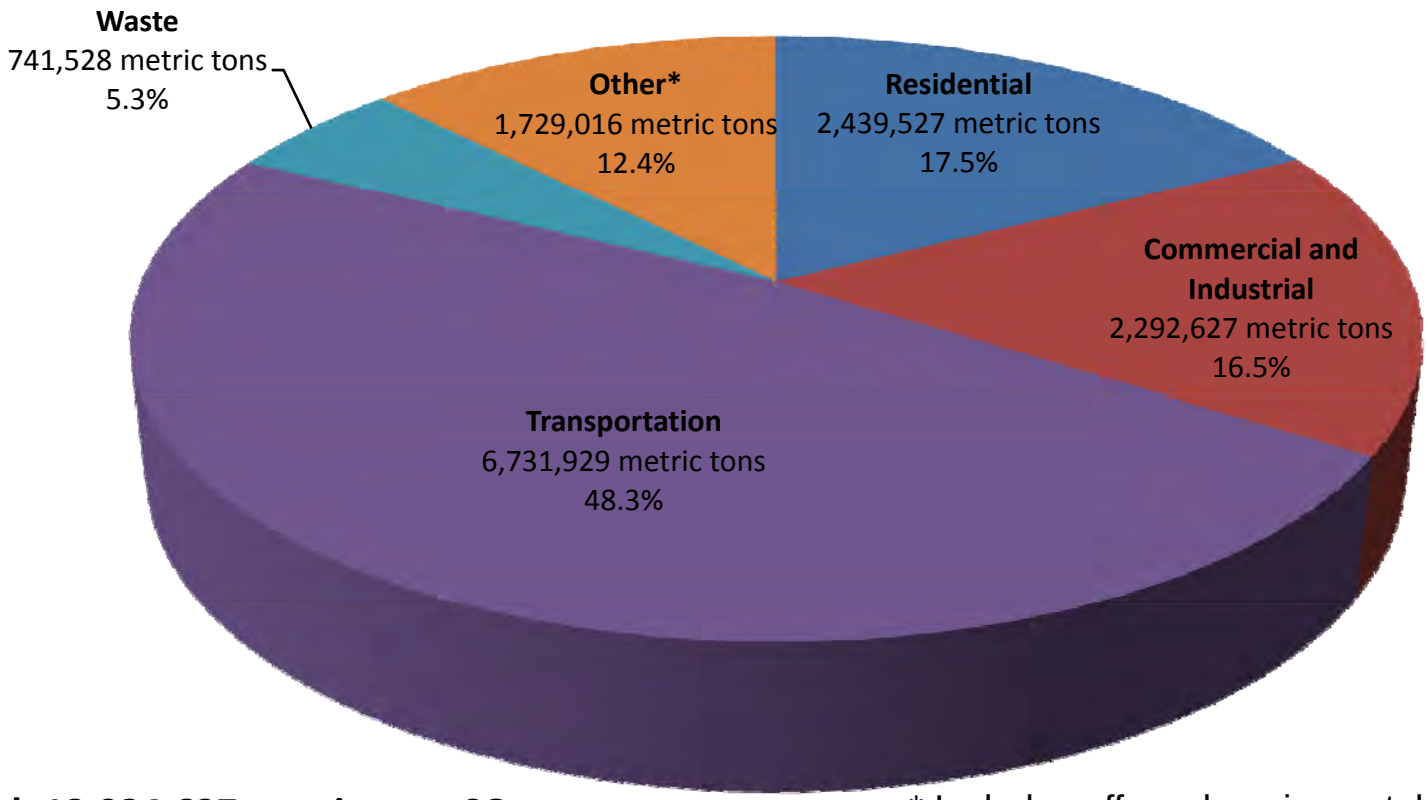
California Emissions By Sector




California Population and "Business as Usual" Emissions(1990 – 2050)
Population
GHG Emissions (BAU)
70,000,000
60,000,000
50,000,000
40,000,000
30,000,000
20,000,000
10,000,000
0
Population
700
600
500
400
300
200
100
0
GHG Emissions (Million Metric Tons)
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050


CA Population and Per Capita GHG Emissions Reductions (1990 – 2050)
Population
GHG Emissions Per Capita Goal
Linear (Population)
Population
70,000,000
60,000,000
50,000,000
40,000,000
30,000,000
20,000,000
10,000,000
0
GHG Emissions Per Capita (metric tons/person)
18
16
14
12
10
8
6
4
2
0
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050

Sacramento County Emissions by sector (CO2e)



Total: 13,934,627 metric tons CO_2e

* Includes off-road equipment, high GWP gases, industrial-specific, agriculture, wastewater treatment, and the Sacramento International Airport

What is the point of GHG Inventories and CEQA Analysis of GHGs?

- ….keeping consultants and staff busy?
- ….getting really proficient at Excel and graphic software?
- …..avoiding a lawsuit from the Attorney General?
- …..or one from the Sierra Club?

- Maybe it should be this instead:
  - Developing the information necessary to provide decision makers with the most cost effective strategies to do our fair share to avert catastrophic outcomes for California and the planet?

Climate Change Consequences

- Warmer Temperatures
- Drought and Wildfire
- More intense rainstorms
- Deadly heat waves & spread of disease
- More powerful hurricanes
- Melting glaciers, early ice thaw
- Sea-level rise
- Species extinction
- Mass human migration – political turmoil

Stabilization Goal

- The scientific community is not envisioning a future without climate change
- Nearly all predictions and policy goals anticipate some climate changes as a consequence of GHG emissions
- The current goal is to have global temperatures raise by less than 2 degrees Celsius (4^0 F) to avoid the most catastrophic consequences of climate change
- It is currently thought that the industrialized countries will have to reduce emissions 80% below their 1990 to meet the stabilization goal.
- Reducing emissions to 1990 levels by 2020 is….just the beginning

Unit 2
Greenhouse Gas Regulatory Framework and CEQA Ten Steps

Rich Walter
ICF Jones & Stokes

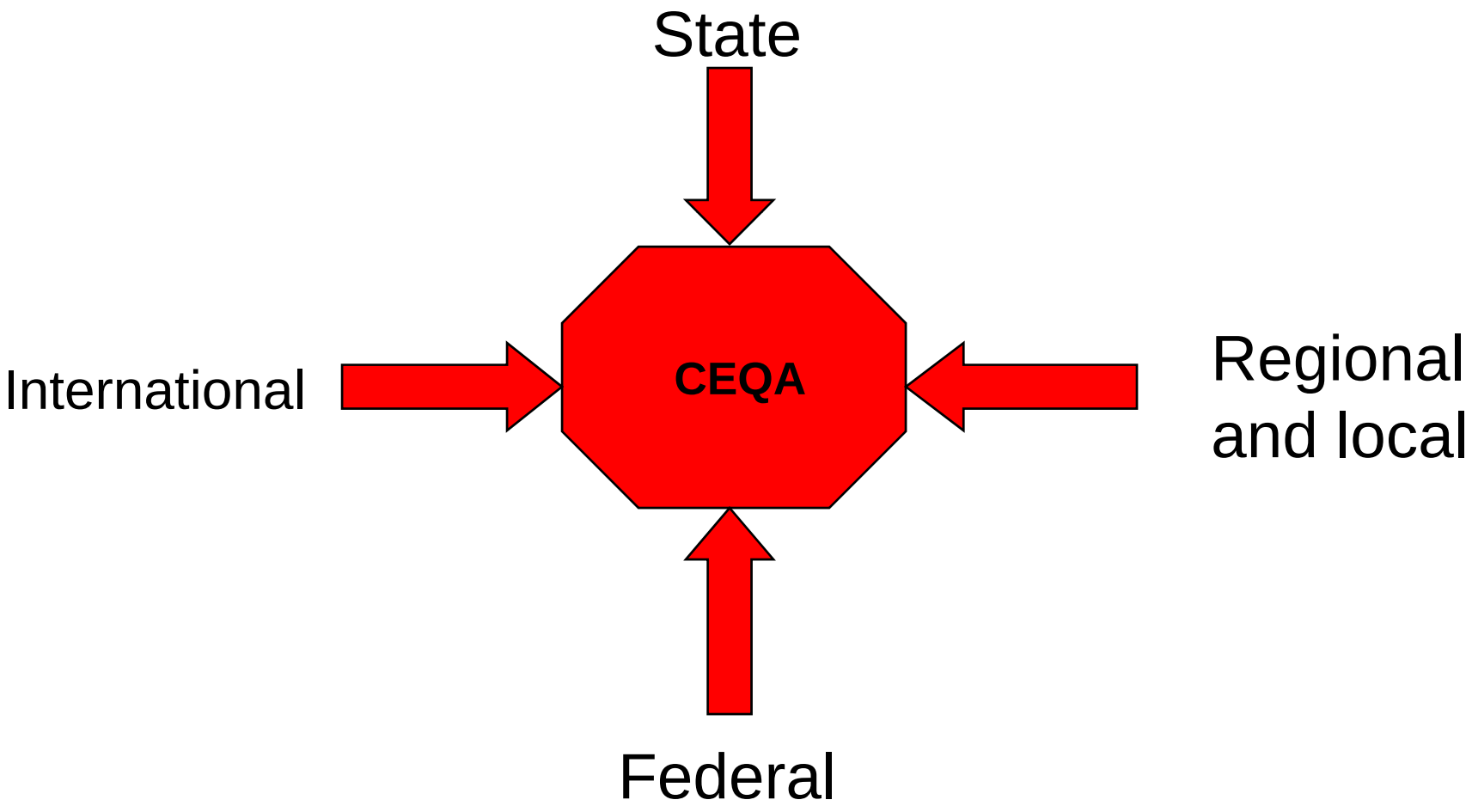
Presented at the PCAPCD Climate Change Workshop

August 26, 2009

Unit 2 – GHG Regulatory Framework and CEQA Ten Steps

- Regulatory Framework
  - International Policy
  - Federal Action/Debate
  - State legislation
  - State agencies
  - The Attorney General
  - Regional/Local Efforts
- CEQA Ten Steps

Laws, Programs, and Policies Influencing Climate Change Analysis under CEQA



U.N. Framework Convention on Climate Change (Rio de Janeiro, 1992)

- 192 countries ratified (including U.S.)
- Gather and share information on emissions
- Launch national strategies to address emissions
- Cooperate in developing strategies for adaptation to oncoming climate change

Kyoto Protocol (1997)

- Intended as a first step, not as a final solution
- Committed developed countries to stabilize GHG emissions
- Entered into force in 2005 when Russia ratified.
- U.S. never ratified

Kyoto Protocol (Cont.)

- 37 developed countries (Annex 1)
  - Committed to reduce an average of 5% below 1990 levels by 2012.
- Remaining 137 signatories were developing countries (Non-annex)
  - Monitor and report emissions
  - No committed emission reductions
  - Participate in the Clean Development Mechanism to obtain assistance from Annex 1 countries
- Who has achieved their targets to date?
  - U.K,. Germany, former Soviet Block countries

Bali, 2007

- Acknowledged evidence for global warming
- Cutting emissions
  - Called for reductions by developed countries (exact targets to be negotiated later)
  - Provides mechanism for financial assistance to developing countries
- Adaptation: support for poorer countries to develop adaptation measures
- Forests: Policy and incentives to prevent de-forestation

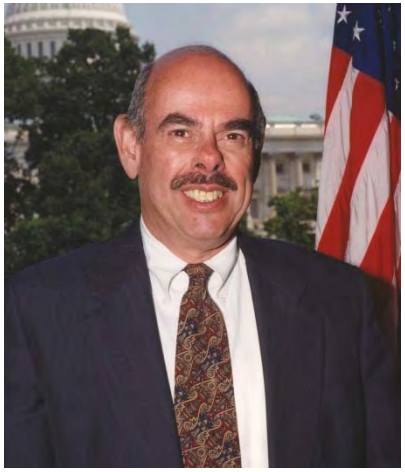
Copenhagen, 2009: A Successor to Kyoto?

What is the Federal Government doing?

- Stimulus (American Reinvestment and Recovery Act)
  - $71 billion for clean energy investments
  - $20 billion in clean energy tax incentives
- U.S. Budget
  - Presumes Cap and Trade System
    - 14% below 2005 by 2020
    - 83% below 2005 by 2050
  - $15 billion/year for renewables and efficient vehicles

Congress: ACESA [Waxman-Markey]

- American Clean Energy and Security Act of 2009 (ACESA)
  - Waxman-Markey; Passed by House June 26, 2009
    - By a vote of 219 to 212…
  - Cap and Trade System
    - Sources > 25,000 tons of CO2e
    - Reductions
      - 3% below 2005 by 2012
      - 17% below 2005 by 2020
      - 42% below 2005 by 2030
      - 83% below 2005 by 2050
    - Offsets, Banking, and Reserves
  - Support for International Deforestation Prevention



Congress: ACESA [Waxman-Markey]

- Energy
  - Renewable Portfolio Standard (6% by 2012; 20% by 2025)
  - Building Energy Efficiency (+30% in 2012; + 50% in 2016)
  - Carbon Capture and Sequestration (CCS) promotion
  - Support for Energy Efficiency
  - Smart Grid/Transmission
- Vehicles and Fuels
  - Fuel Economy /Mobile Source Emission Standards
- Other
  - Programs for HFCs and black carbon.
  - Exempts GHGs from Clean Air Act and New Source Review

Congress: ACESA [Waxman-Markey]

- Offsets
  - 1 billion tons from domestic sources
  - 1 billion from international sources
- Cost
  - Depends who you ask
  - CBO estimates $175/household
  - Low income household = benefit of $40/year
  - Does not include savings of avoided climate damages

What is the Federal Government doing?

- Federal Agencies
  - CEQ
    - Old NEPA guidance withdrawn
    - No new NEPA guidance….yet
  - EPA
    - Preliminary Endangerment Finding (Clean Air Act)
    - California Waiver (AB 1493)?
    - Commenting on Draft EISs on an ad hoc basis
  - Other agencies
    - addressing GHG/Climate Change on an inconsistent and hoc basis

AB 32 and S-03-05

- Recognized the Climate Change problem facing California
- Established the following greenhouse gas emission reduction targets for California:
  - by 2020,reduce GHG emissions to 1990 levels.
- Gov's Executive Order S-3-05 established targets for state agencies:
  - by 2010, reduce GHG emissions to 2000 levels;
  - by 2050, reduce GHG emissions to 80 percent below 1990 levels.

ARB Draft Scoping Plan Adopted December 2008

Regional Transportation-Related GHG Target of 5 MMT CO2e

Recommended Goal for Cities and Counties of 15% reduction below current levels

Table 2: Recommended Greenhouse Gas Reduction Measures

Recommended Reduction Measures	Reductions Counted Towards 2020 Target ($MMTCO_2E$)	
ESTIMATED REDUCTIONS RESULTING FROM THE COMBINATION OF CAP-AND-TRADE PROGRAM AND COMPLEMENTARY MEASURES		**146.7**
California Light-Duty Vehicle Greenhouse Gas Standards • Implement Pavley standards • Develop Pavley II light-duty vehicle standards	31.7	
Energy Efficiency • Building/appliance efficiency, new programs, etc. • Increase CHP generation by 30,000 GWh • Solar Water Heating (AB 1470 goal)	26.3	
Renewables Portfolio Standard (33% by 2020)	21.3	
Low Carbon Fuel Standard	15	
Regional Transportation-Related GHG Targets[16]	5	
Vehicle Efficiency Measures	4.5	
Goods Movement • Ship Electrification at Ports • System-Wide Efficiency Improvements	3.7	
Million Solar Roofs	2.1	
Medium/Heavy Duty Vehicles • Heavy-Duty Vehicle Greenhouse Gas Emission Reduction (Aerodynamic Efficiency) • Medium- and Heavy-Duty Vehicle Hybridization	1.4	
High Speed Rail	1.0	
Industrial Measures (for sources covered under cap-and-trade program) • Refinery Measures • Energy Efficiency & Co-Benefits Audits	0.3	
Additional Reductions Necessary to Achieve the Cap	34.4	
ESTIMATED REDUCTIONS FROM UNCAPPED SOURCES/SECTORS		**27.3**
High Global Warming Potential Gas Measures	20.2	
Sustainable Forests	5.0	
Industrial Measures (for sources not covered under cap and trade program) • Oil and Gas Extraction and Transmission	1.1	
Recycling and Waste (landfill methane capture)	1.0	
TOTAL REDUCTIONS COUNTED TOWARDS 2020 TARGET		**174**

Other Recommended Measures	Estimated 2020 Reductions ($MMTCO_2E$)
State Government Operations	1-2
Local Government Operations	TBD
Green Buildings	26
Recycling and Waste (other measures)	9
Water Sector Measures	4.8
Methane Capture at Large Dairies	1.0

[16] This number represents an estimate of what may be achieved from local land use changes. It is not the SB 375 regional target. ARB will establish regional targets for each Metropolitan Planning Organization (MPO) region following the input of the Regional Targets Advisory Committee and a public consultation process with MPOs and other stakeholders per SB 375.

SB 375 (Steinberg)

- Regional Targets Advisory Committee (RTAC) to develop regional goals (http://www.arb.ca.gov/cc/sb375/rtac/rtac.htm)
- ARB to provide each MPO with a GHG reduction target by September 30, 2010
- MPO must include in Regional Transportation Plan (TRP) a "Sustainable Communities Strategy" designed to achieve the ARB target
- ARB reviews whether SCS will meet target
- MPO, if unable to achieve ARB target, must establish an "Alternative Planning Strategy "

SB 375
State/Regional/Local Relationships

ARB Adopts GHG Reduction Targets for each MPO

↓

MPO develops "*Sustainable Communities Strategy* "in Regional Transportation Plan

↓

City and County

- Adopts Housing Elements consistent with SCS
- Relies on CEQA Exemptions for consistent "*Transit Priority Projects*"

SB 375
Overview

- Cities and counties must amend Housing Elements every 8 years to conform to the RTP; and re-zone land accordingly within 3 years
- Creates a new CEQA exemption for “Sustainable Communities Projects” that are consistent with SCS or APS
- Creates “Transit Priority Project” EA and
- Residential and Commercial streamlining procedures for certain projects

Proposed OPR CEQA Guidelines Amendments for GHG Emissions (released April 13, 2009)

- Significance
  - Identifies factors to consider in determining whether GHG emissions have a significant effect on the environment (Sec. 15064.4)
  - No specific thresholds (…but CARB is working on them)
- Mitigation
  - Categories of mitigation for GHG impacts (Sec. 15126.4)
- Cumulative Impacts
  - GHG impacts must be considered in determining the whether a project makes a considerable contribution to a cumulative impact (Sec. 15130)
- Initial Study Checklist (Appendix G)
  - GHGs Added

Draft CEQA Guidelines Amendments for GHG Emissions (released April 13, 2009)

- Tiering
  - Allows agencies to tier GHG emissions analysis and mitigation off of programmatic analysis if they were subject to a certified EIR (Sec 15183.5)
  - Defines Programmatic CEQA Document for tiering as including:
    - Quantification of current/projected emissions
    - Cumulative threshold based on substantial evidence
    - Analysis of emissions from actions within geographic area
    - Identification of measures to achieve specified emissions level
    - Plan monitoring and amendment if not working
    - Adoption in a public process following environmental review

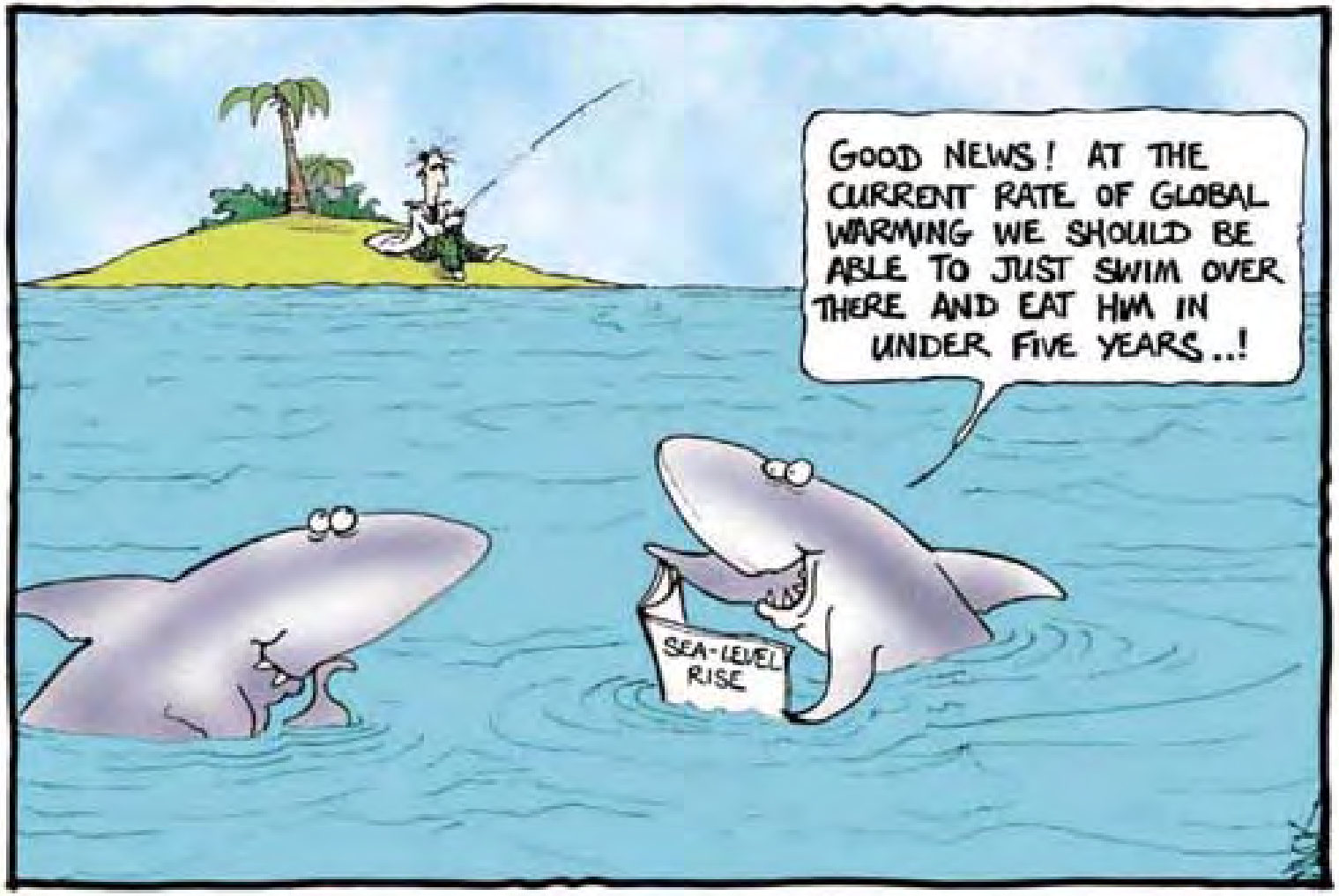
California Major Players

- CARB
- CEC
- DWR
- Caltrans
- OPR
- Attorney General

Climate Change and CEQA
The Ten Steps

- Why Analyze in CEQA?
- Environmental Setting (Steps 1 to 3)
- Impact Analysis (Steps 4 to 8)
- Alternatives (Step 9)
- Mitigation (Step 10)

Reasons for Not Evaluating in CEQA



Reasons for Not Evaluating in CEQA

- "…It is not required…."
- "…we scoped it out of our document…."
- "… the impacts are "speculative" and not foreseeable…."
- "…we can't solve the global problem so why discuss it…?"
- "… why should we worry about polar bears when our project is in Rocklin…?"

CEQA Already Requires GHG Emissions and Impacts to be Evaluated

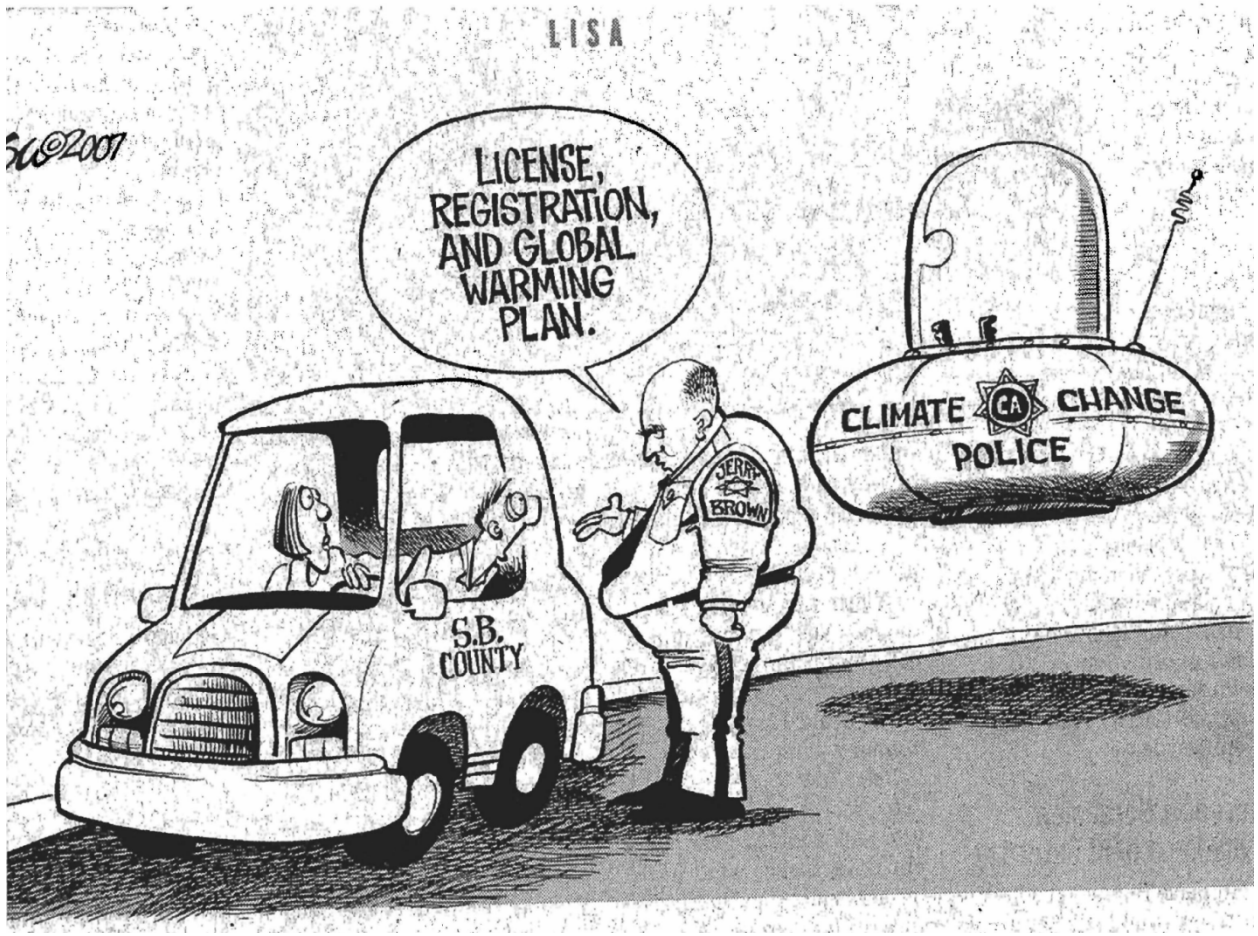
- "To the fullest extent possible the lead agency should integrate CEQA review with …related environmental review and consultation requirements (CEQA Guidelines sec. 15124(d)(1)]

- CEQA documents must identify mitigation for a project's significant environmental impacts (CEQA Guidelines sec. 15126.4)

CEQA *Already* Requires GHG Emissions and Impacts to be Evaluated

- Effects on air quality fall under CEQA's definition of "Environment" – (CEQA Guidelines sec. 15360)
- CEQA requires evaluation of "direct" and "indirect" and "cumulative" effects – (CEQA Guidelines 15126.2, 151300)
  - GHG emissions are either direct or reasonable foreseeable indirect effects on the human environment
  - Climate change impacts are inherently cumulative and, therefore, of fall within CEQA's definition of "cumulative impacts" (CEQA Guidelines 15355)

Another Reason for Evaluating in CEQA…



Another Reason for Evaluating in CEQA…

- Attorney General's Office
  - Aggressive stance on G.P. and CEQA litigation
  - Commenting on CEQA Documents
  - Settlement agreements
- California courts
  - No appellate decision on GHG yet
  - Several lower court decisions have ruled that CEQA was violated because lead agency failed to evaluate GHG/Climate change impacts

Fundamental Aspects of Climate Change Impact Analysis

Impacts on Climate Change

- Basic question: What is my project's GHG contribution?
- Desired result: To reduce the contribution to climate change by mitigating GHG emissions

Impacts of Climate Change

- Basic questions: How would climate change affect my project?
- Desired result: To adequately prepare a project/plan area for the inevitability of climate change (e.g. "adaptation")

What to Include in CEQA Documents Ten Steps to Ensuring Full Disclosure

- Environmental Setting
  - **Step 1** – Describe the existing global context in which climate change impacts are occurring and are expected to occur in the future
  - **Step 2-** Summarize the relevant state laws that address climate change (e.g. California Global Warming Solutions Act etc.)
  - **Step 3** – Describe any relevant statewide and/or regional GHG inventories to which the project would contribute

What to Include in CEQA Documents Ten Steps to Ensuring Full Disclosure

- Environmental Impacts
  - **Step 4** – Quantify the baseline GHG emissions
  - **Step 5** –Quantify the project's direct and indirect GHG emissions including construction and operations

What to Include in CEQA Documents Ten Steps to Ensuring Full Disclosure

- Environmental Impacts
  - **Step 6** – Make a significance determination. Discuss whether the project would enhance or impede the attainment of state GHG reduction targets and its relationship to local plans and policies.

What to Include in CEQA Documents Ten Steps to Ensuring Full Disclosure

- Environmental Impacts
  - **Step 7** - Describe the cumulative, global climate change impacts to which the project would contribute
  - **Step 8** – Describe how the impacts of global climate change could impact the project

What to Include in CEQA Documents Ten Steps to Ensuring Full Disclosure

- Mitigation Measures
  - **Step 9** - Identify feasible mitigation measures that would reduce GHG emissions

- Alternatives
  - **Step 10** – Include alternatives that would meet the Project Objectives but would also reduce GHG emissions

Potential CEQA findings

Potential	Not Recommended
• Less than significant (=all projects!) • Less than cumulatively considerable (<threshold) • Significant and but avoidable with mitigation • Significant and unavoidable	• Not a CEQA issue • Speculative at a project level

Unit 3A
GHG Quantification and Tools

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Presented at the PCAQMD Climate Change Workshop
August 26, 2009

GHG Quantification for CEQA Projects

- **Project Inventories- What is New?**
  - Not measured by determining if the individual resident or business is “new”
  - Measured by determining if the project results in population or economic growth.
  - California is growing and thus in most cases new growth results in new emissions.
  - If project directly replaces existing emissions, project results in “new” emissions but might have no net increase.

"Direct" and "Indirect" Effects: What is foreseeable and what is speculative?

- Direct GHG emissions –
  - Construction impacts (vehicles, equipment)
  - Operational impacts (vehicles, fuel consumption)
- Indirect GHG emissions
  - Electricity consumption (power plan emissions)
  - Waste generation (landfill methane)
- Supply chain impacts – how far "up-stream?"
- Supply chain impacts – how far "down-stream?"

Greenhouse Gas Quantification Tools and Methods

- In general, no one stop-shop tool available for all projects
- Quantification will often rely on a combination of established models, protocols, boutique tools/models, and other customized approaches to form a comprehensive analysis
- Quantification utilizes tools that are meant to predict future year emissions and inventory current emissions
- Most tools/models will evaluate CO2, CH4, and N2O emissions

Greenhouse Gas Sources

- Construction activities
  - Associated with most types of projects
  - Direct emissions
    - Construction equipment and vehicles
  - Indirect emissions
    - Electricity used for construction
    - Waste
  - Building materials
    - Lifecycle emissions?

Greenhouse Gas Sources

- Operational emissions
  - Emission types and sources vary from project to project
  - Direct Emissions
    - On-road mobile source emissions
    - Maintenance/landscaping activities
    - On-site processes
  - Indirect Emissions
    - Electricity and fuel use for power and heating
    - Water supply/waste water treatment
    - Waste (landfill emissions)

Greenhouse Gas Sources

- Life-cycle
  - Indirect emissions inherent to the manufacture and shipment of a product
  - Often difficult to characterize due to issue of drawing a boundary around scope of emission sources
    - Source vs. end-user
  - Attorney General comment letter to SJVAPCD states:
    - "CEQA does not require independent research to trace back to its source every single material…but there is no reason that existing, readily available information about lifecycle emissions should not be included in the CEQA analysis."
  - Lead agencies should identify appropriate scope of life-cycle analyses for projects

Greenhouse Gas Sources

- Recommendations
  - Use established protocols and models
  - Quantify all reasonable activity
  - Don’t quantify speculative emissions, but list them
  - Update analysis as methods evolve

Greenhouse Gas Quantification Tools

- Traditional Models
  - URBEMIS2007 (Rimpo & Associates)
    - Calculates emissions for land use and construction projects
  - EMFAC2007 (California Air Resources Board)
    - Calculates emission factors from motor vehicles
  - CT-EMFAC (California Department of Transportation)
    - Calculates emission factors from motor vehicles
  - OFFROAD2007 (California Air Resources Board)
    - Calculates emission factors from off-road vehicles
  - Road Construction Emissions Model (SMAQMD)
    - Calculates construction emissions for roadway projects

Greenhouse Gas Quantification Tools

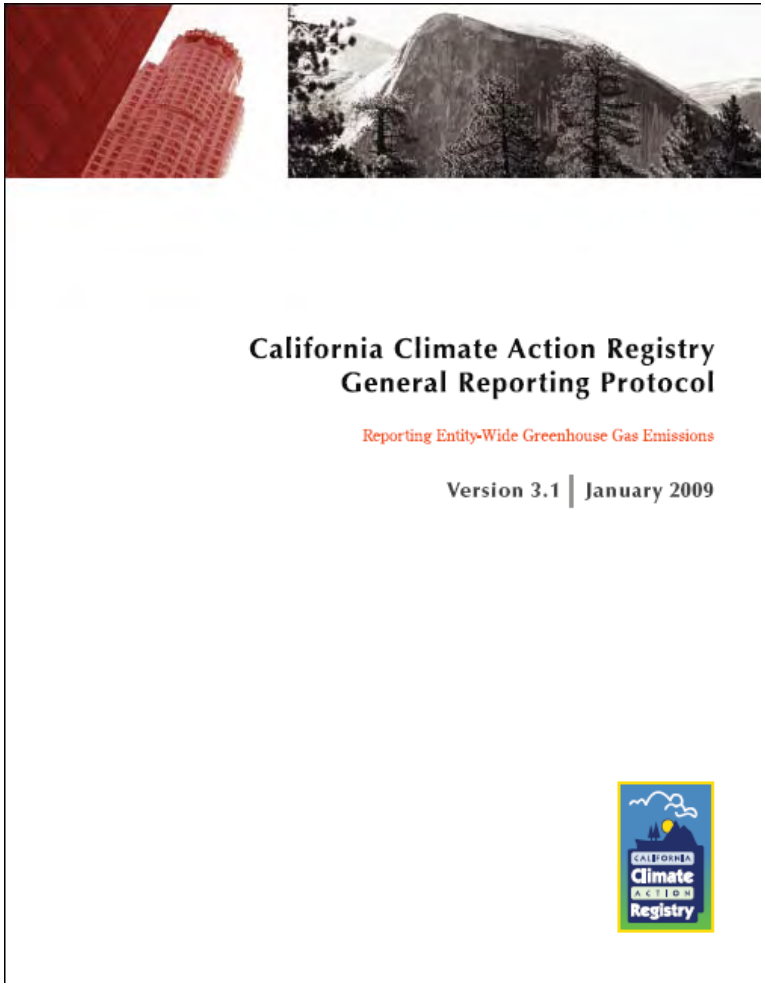
- Other Traditional Models (not Commonly Used in California)
  - MOBILE 6.2 (U.S. Environmental Protection Agency)
    - Calculates emission factors from motor vehicles
  - NONROAD 2007 (U.S. Environmental Protection Agency)
    - Calculates emission factors from off-road vehicles
  - MOVES – currently in draft form (U.S. Environmental Protection Agency)
    - Calculates emission factors from motor vehicles

Greenhouse Gas Quantification Tools

- Inventory Models
  - Clean Air and Climate Protection
    - ICLEI - Local Governments for Sustainability
    - Inventory tool for local governments
  - Software for Cities
    - Torrie-Smith Associates
    - Inventory tool for local governments
- Land Use/Scenario Planning
  - INDEX (Criterion Planners)
  - Sustainable Communities Model (CTG)
  - I-PLACE3S (CA/OR/WASH state energy offices)

Greenhouse Gas Quantification Tools

- Protocols
  - California Climate Action Registry General Reporting Protocol, Version 3.1
  - ARB/ICLEI/CCAR/Climate Registry Local Government Operations Protocol
    - Local government inventory protocol for government operations
  - U.S. EPA Methodology from Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2007
    - Methodology for U.S. GHG inventory



Greenhouse Gas Quantification Tools

- Protocols (continued)
  - IPCC Guidance for National Greenhouse Gas Inventories
    - Guidance from IPCC for conducting inventories
  - World Business Council for Sustainable Development/World Resources Institute Greenhouse Gas Protocol
    - Inventory protocols/tools for a variety of sources
  - Local Community Protocol (in progress, expected….)
    - Inventory protocol for community operations

Greenhouse Gas Quantification Tools

- Other Resources
  - EIA databases for energy
  - CEC Info
  - Land GEM, ARB landfill – landfill gas
  - U.S. Environmental Protection Agency AP-42 Emission Factors

Unit 3b
Thresholds of Significance

Rich Walter
ICF Jones & Stokes

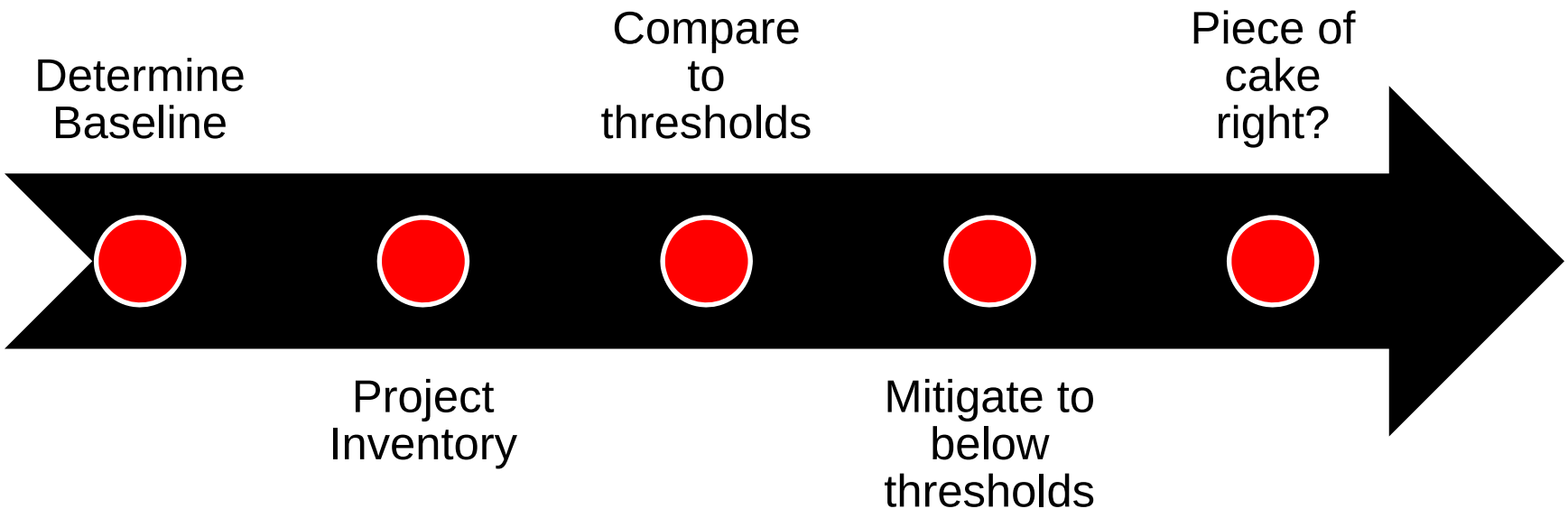
Presented at the PCAPCD Climate Change Workshop

August 26, 2009

Unit 3b – "Thresholds of Significance"

- Why are "thresholds" important?
- CAPCOA report and approaches
- CARB thresholds framework
- BAAQMD thresholds framework
- SJVUAPCD thresholds framework
- SCAQMD thresholds framework
- PCAPCD thresholds framework

Climate Change CEQA Impact Analysis



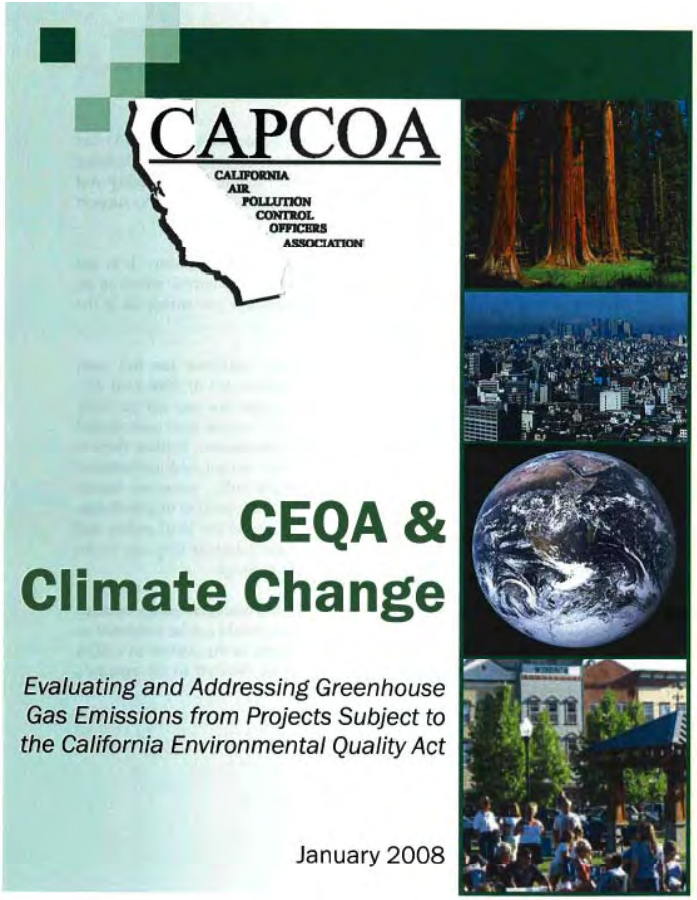
Thresholds

- Significance Thresholds
  - CEQA not mentioned in AB 32
  - OPR guidelines proposed April 2009
    - But no thresholds proposed….
  - Different concepts exist
  - Importance of cumulative context

Significance Threshold Jeopardy

What will the state do?	What will new development need to do?	What about newly developed communities?
How to avoid de minimus arguments?	How to support “positive” action?	How to avoid inefficiency?
How to avoid ineffective action?	What about Negative Declarations?	What about Categorical Exemptions?

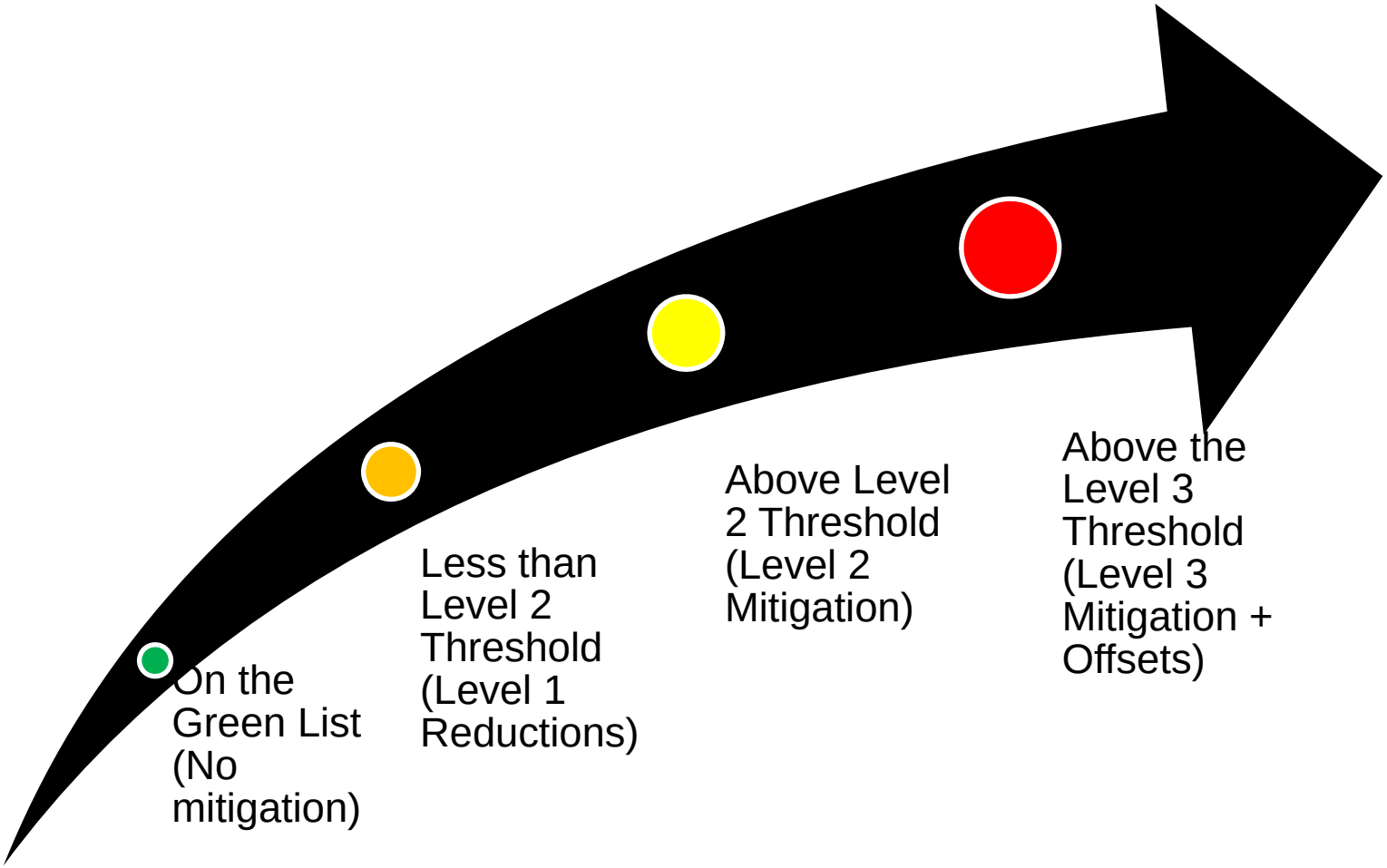
California Air Pollution Control Officers Association (CAPCOA) CEQA and Climate Change

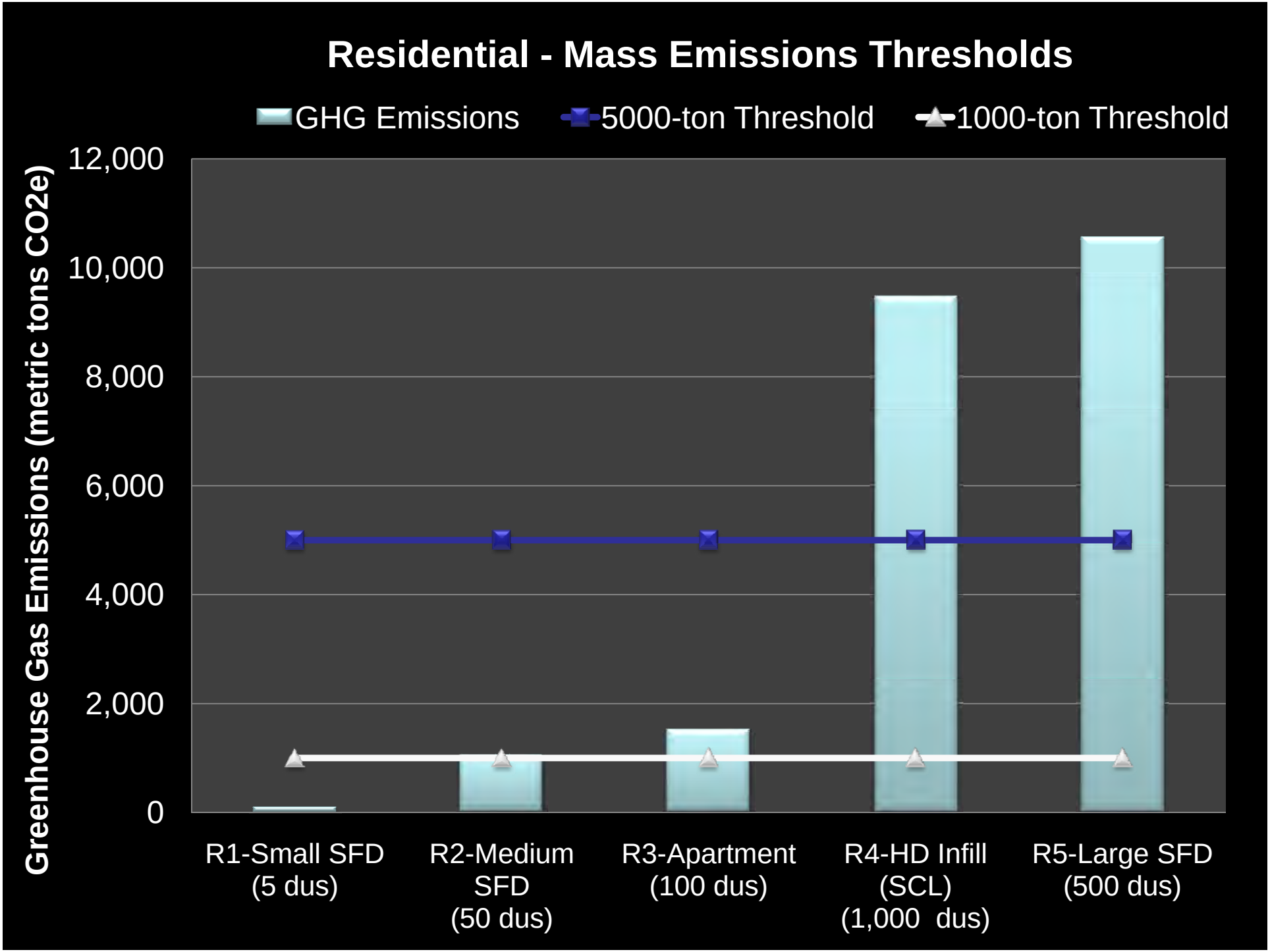


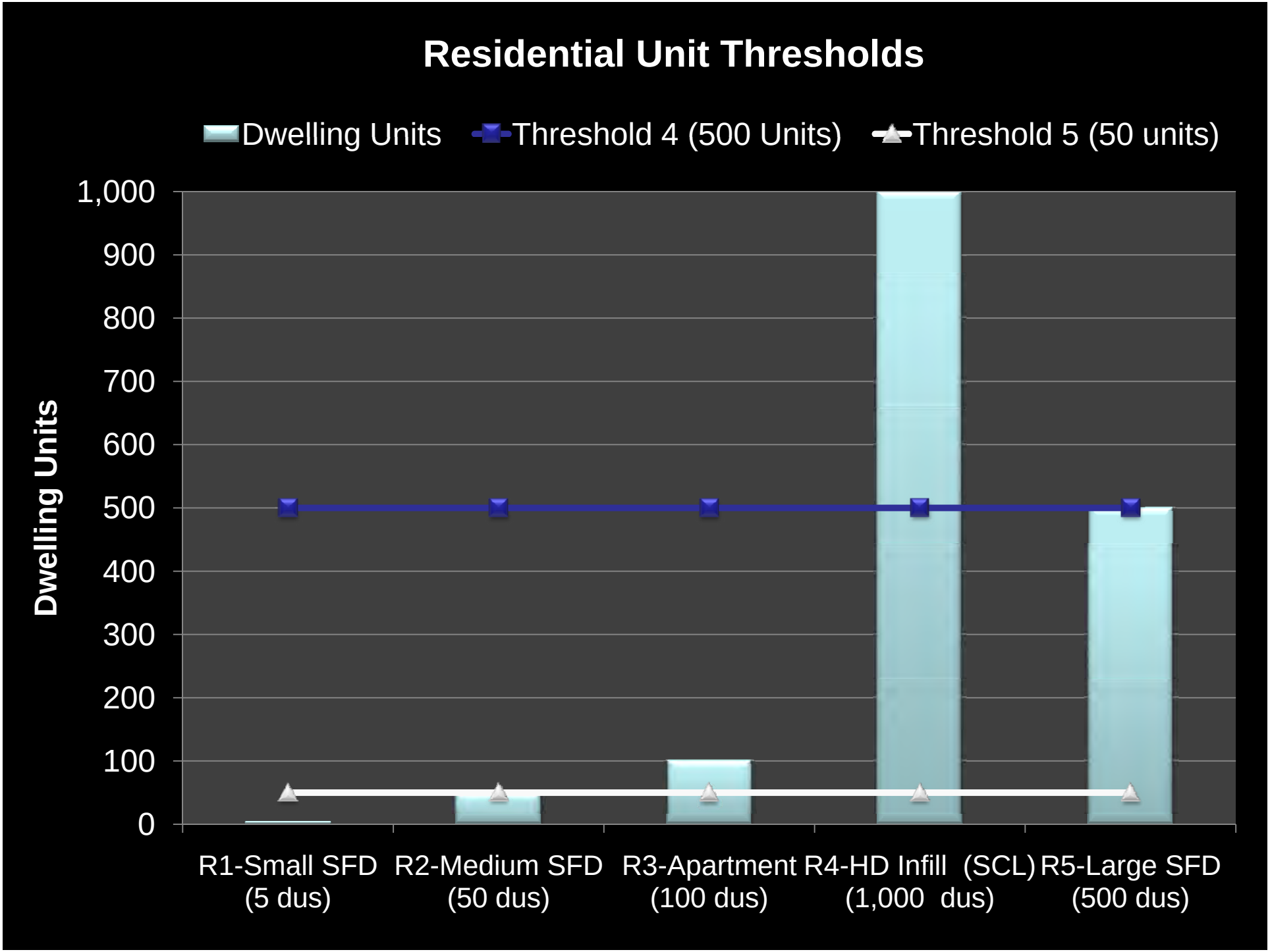
Potential Thresholds

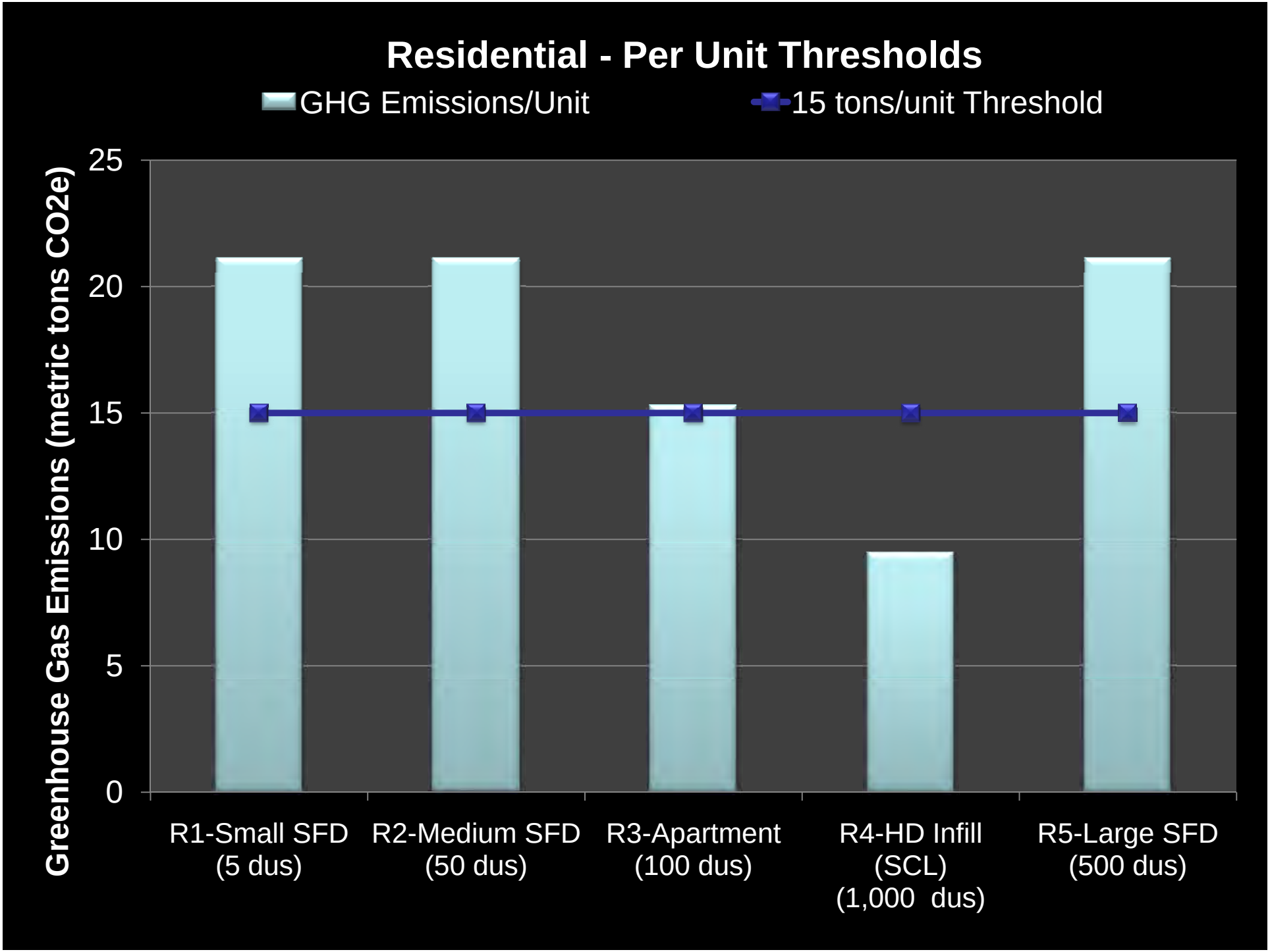
Zero	• Zero emissions above baseline
Quantitative	• Mass emissions • Percentage reduction • Sectoral
Qualitative	• Units (Trips, etc.) • VMT
Efficiency-Based	• Emissions/capita • Emissions/unit • Emissions/job or $GSP
Greenlist	• Example: Extending transit to existing developed areas; park & ride; Bicycle, pedestrian, or zero emission transportation infrastructure.

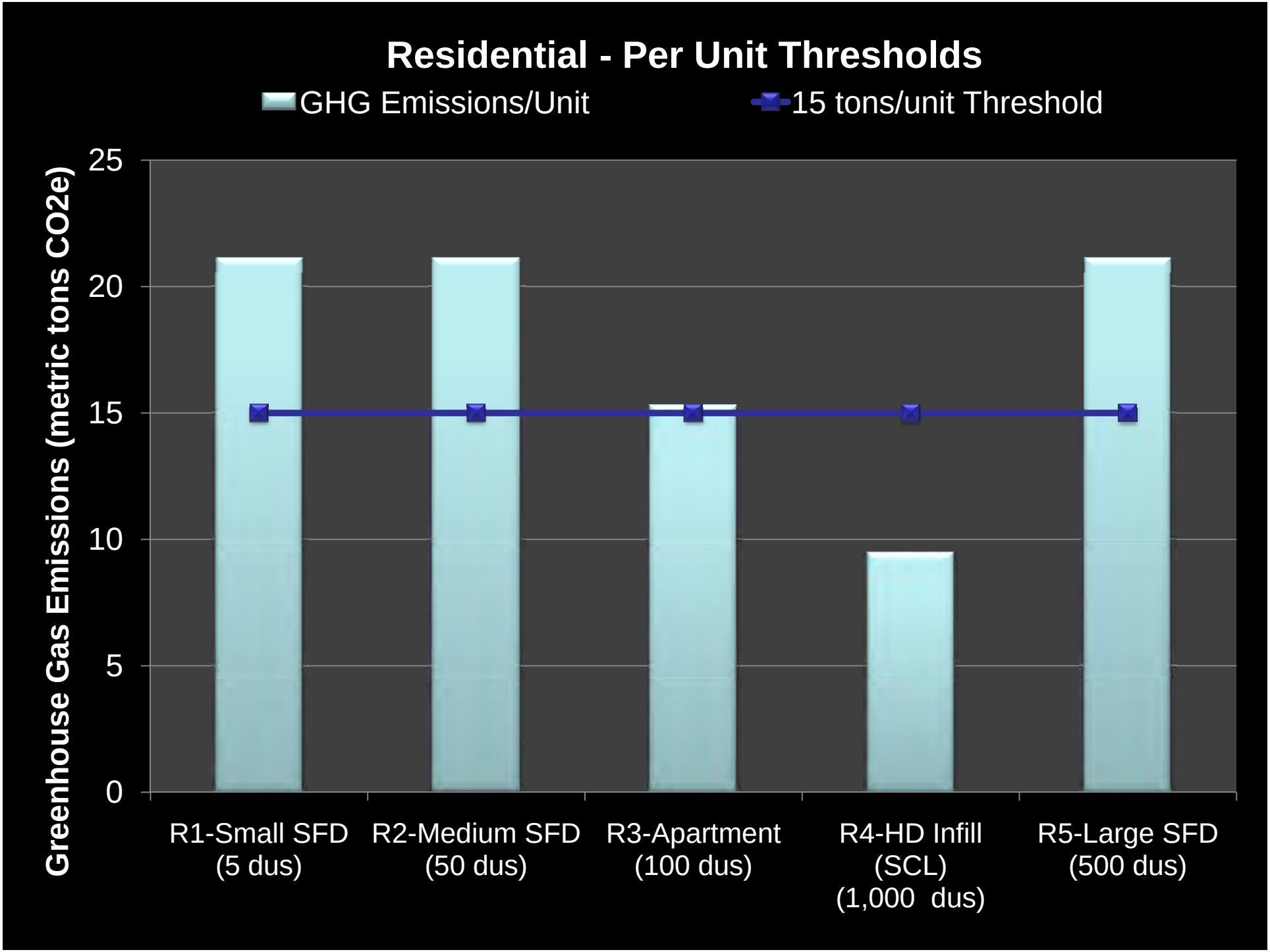
Tiered Approach

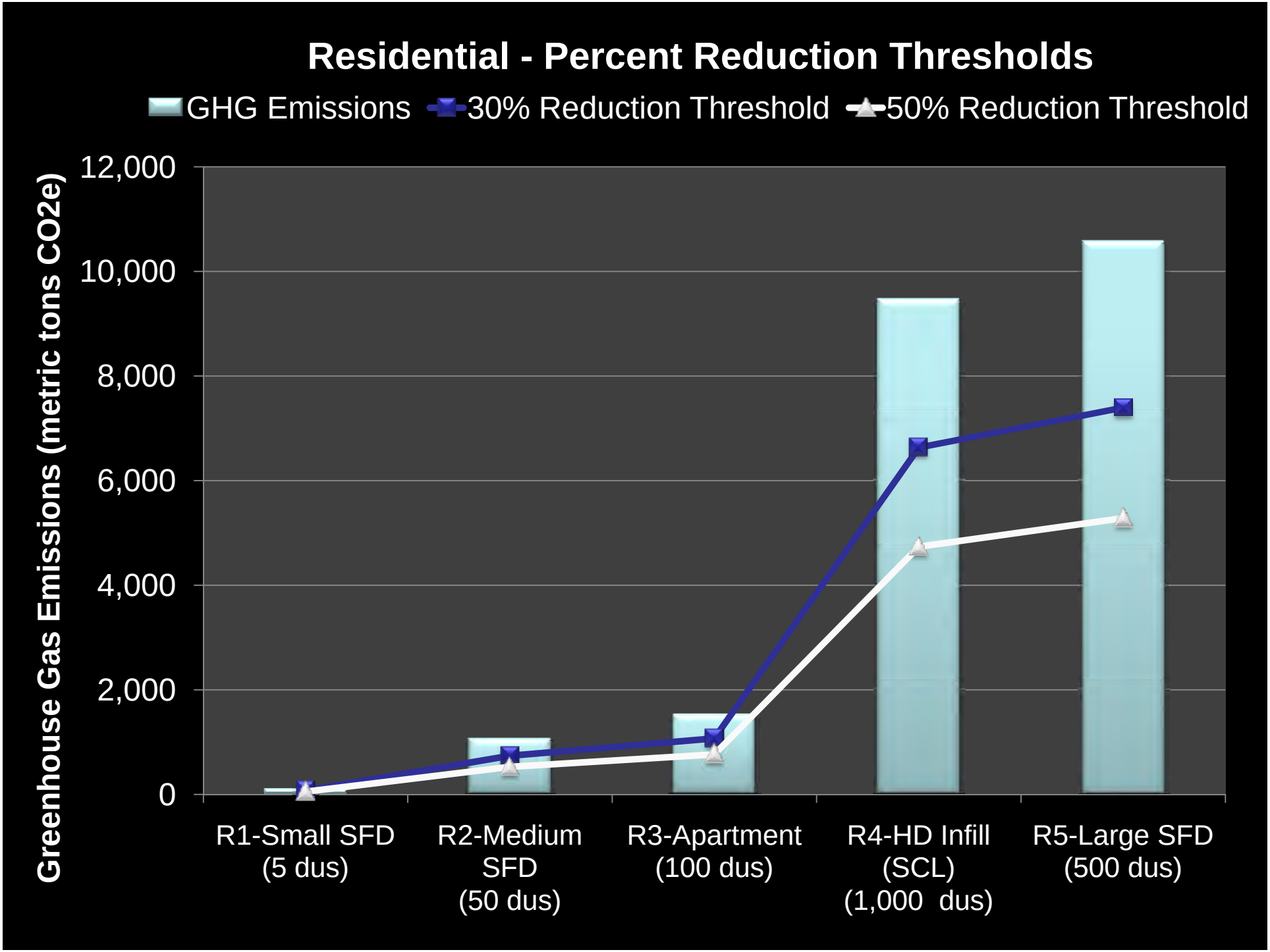



Residential - Mass Emissions Thresholds
GHG Emissions
5000-ton Threshold
1000-ton Threshold
Greenhouse Gas Emissions (metric tons CO2e)
12,000
10,000
8,000
6,000
4,000
2,000
0
R1-Small SFD (5 dus)
R2-Medium SFD (50 dus)
R3-Apartment (100 dus)
R4-HD Infill (SCL) (1,000 dus)
R5-Large SFD (500 dus)


Residential Unit Thresholds
Dwelling Units
Threshold 4 (500 Units)
Threshold 5 (50 units)
Dwelling Units
1,000
900
800
700
600
500
400
300
200
100
0
R1-Small SFD (5 dus)
R2-Medium SFD (50 dus)
R3-Apartment (100 dus)
R4-HD Infill (SCL) (1,000 dus)
R5-Large SFD (500 dus)


Residential - Per Unit Thresholds
GHG Emissions/Unit
15 tons/unit Threshold
Greenhouse Gas Emissions (metric tons CO2e)
25
20
15
10
5
0
R1-Small SFD (5 dus)
R2-Medium SFD (50 dus)
R3-Apartment (100 dus)
R4-HD Infill (SCL) (1,000 dus)
R5-Large SFD (500 dus)


Residential - Per Unit Thresholds
GHG Emissions/Unit
15 tons/unit Threshold
Greenhouse Gas Emissions (metric tons CO2e)
25
20
15
10
5
0
R1-Small SFD (5 dus)
R2-Medium SFD (50 dus)
R3-Apartment (100 dus)
R4-HD Infill (SCL) (1,000 dus)
R5-Large SFD (500 dus)


Residential - Percent Reduction Thresholds
GHG Emissions
30% Reduction Threshold
50% Reduction Threshold
Greenhouse Gas Emissions (metric tons CO2e)
12,000
10,000
8,000
6,000
4,000
2,000
0
R1-Small SFD (5 dus)
R2-Medium SFD (50 dus)
R3-Apartment (100 dus)
R4-HD Infill (SCL) (1,000 dus)
R5-Large SFD (500 dus)

CARB Draft Threshold

- Tiered/Hybrid Approach
  - Tier 1: Compliance with reduction plan
  - Tier 2: Compliance with Performance Standards
    - Construction
      - Alternative transportation
      - Recycle and salvage 75% of material
      - Use 20% recycled material
    - Energy – 30% better than BAU
    - Water
      - Indoor use 20 % better than CA Green Bldg. Code
      - Outdoor use 50% better than CA Green Bldg. Code

CARB Draft Threshold

- Tier 2 – Performance Standards (continued)
  - Waste
    - fully use local recycling and composting programs
  - Transportation
    - Residential - 14,000 VMT/household
    - Commercial – proximity and design
    - ½ mile of residential zone with at least 10 du/acre
    - ½ mile of at least 10 neighborhood services with pedestrian access
    - Transportation demand management for employee trip reduction by 20%
- Tier 3 - Compliance with Quantitative Limit ("X")

BAAQMD Draft Thresholds

- Construction
  - Best Management Practices
  - Regional Inventory Basis
    - Determined regional construction inventory for 2020 and 1990
    - Identified level of reduction to get to 1990 levels
    - Identified number of projects
    - ~10 tons per day
  - Project Lifetime Basis
    - Based on Operational Threshold of 1,175 MT over 30 years
    - 35,250 MT CO2e

BAAQMD Draft Thresholds

- Operations
  - Gap Analysis
    - State Land Use Reductions per AB-32 Goals (= 24%)
    - ID effect of Scoping Plan/Regs on Bay Area LU inventory (= 21%)
    - Identify Land Use “Gap” to be addressed through CEQA (= 3%)
    - Identify threshold and mitigation levels to fill “Gap”
  - Option 1A: Bright Line Standard
    - Thresholds range from 1,075 to 1,175 MT CO2e/Year
    - If above threshold reduced to threshold or reduce by 30%
  - Option 1B Performance Standard
    - All projects reduce by 24 percent
  - Option 1C: Hybrid
    - All projects reduce by 5 percent
    - Projects over threshold (1,725 to 2,475 MT) reduce by 25 to 30 %

BAAQMD Draft Thresholds

- General Plans/Plan Level
  - Efficiency Metrics
    - Used Land Use Sector Inventory at State level
    - Identified GHG “Efficiency” Needed by 2020 to meet AB 32
    - Per Capita Metric (6.4 MT CO2-e/person)
    - Service Population Metric (4.4 MT CO@-e/(person + jobs)
  - Climate Action Plan
    - Current and Future Inventory
    - Reduction Target to Match AB 32 of S-0305
    - Feasible Reductions
    - Quantification of Reduction
    - Implementation Plan
    - CEQA Document

SCAQMD Threshold Framework

- SCAQMD Threshold
  - Tiered/hybrid approach
  - Tier 1 - Exemptions (including SB 97)
  - Tier 2 - Consistency with GHG reduction plan
  - Tier 3 – Quantitative threshold
    - Industrial threshold – 10,000 tons (Adopted)
    - Residential/commercial (in development)
  - Tier 4 – Performance standards (not yet adopted)
  - Tier 5 – Mitigation/offsets

SJVUAPCD Threshold Framework

- SJVUAPCD Threshold (proposed)
  - A project complying with **Best Performance Standards** would be considered to have a less than cumulatively considerable impact on global climatic change if it:
    - Complies with applicable ARB GHG reduction measures; and
    - Complies with applicable direct GHG regulations or rules
    - Does not require quantification

SJVUAPCD Threshold Framework

- SJVUAPCD Threshold (proposed)
  - A project not complying with **Best Performance Standards** would be considered to have a less than cumulative considerable impact on global climatic change if it:
    - Reduces GHG emissions by 29% (ARB emission reduction targets); and
    - Complies with applicable ARB GHG reduction measures; and
    - Complies with applicable direct GHG regulations or rules
    - Requires quantification

PCAPCD Threshold Framework *(Initial)*

- Preliminary proposal developed in August 08
  - Provided recommended target of mitigation for a new land use projects:
    - Suggested GHG emissions reduction by 29% (ARB emission reduction targets); and
    - Recommended GHG reduction measures including on-site and off-site mitigation from Office of Attorney General and ARB; and
    - Proposed project's design features could be applied as credits for required % of GHG reduction; and
    - Initiated the quantitative analysis of potential GHG mitigation measures
  - Provided recommended review process for GHG impacts and discussed with local jurisdictions and interested parties

PCAPCD Threshold Framework *(Developing)*

- Joined the CAPCOA working group for threshold development and mitigation evaluation
- Initiated the CAPCOA project for the technical analysis of GHG mitigation measures
- Assessing the methodologies for thresholds under development by other districts
  - Tiered approach
  - Quantitative threshold
  - Checklist of mitigation measures (including green building design)
  - Consistency of methodology used by neighboring air districts

PCAPCD has not determined the preferred approach or methodology at this time

Thresholds in Play

Zero	• Common Position of Advocacy Groups	
Quantitative	• BAAQMD • SCAQMD	PCAPCD -*evaluating*
Qualitative	• SJVUAPCD • CARB	
Efficiency-Based	• BAAQMD	
Greenlist	• Noone yet	

Unit 3C
Mitigation

Rich Walter
ICF Jones & Stokes

Presented at the PCAQMD Climate Change Workshop
August 26, 2009

Mitigation for GHG Impacts

- Regional Plans and General Plans
- Climate Action Plans
- Project level mitigation

So…what do we do about it?

- Address on the largest scale feasible
  - Regional Transportation Plans
  - General Plans
  - Specific Plans
  - …and then at the project level!
- Planning determines GHG emissions profile:
  - Vehicles, residences, industry, commerce
  - Land use patterns
  - Urban design

Regional Plans and General Plans

- Regional Plan: potentially an effective way to address CC (SB 375 approach)
  - Allows development of regional approaches; shared solutions; EIR for regional tiering
  - But we've never done this kind of plan; may take years to adopt; implementation/effectiveness unknown
- General plan: Can offer policies; promote better land use patterns
  - General plan must go through the CEQA process, consider cumulative impacts
  - GP EIR can offer point for tiering later actions (Guidelines Section 15183)
  - GP sets stage for local "Climate Action Plan"

General Plans

- Incorporate in Routine Elements
  - Land use Element
  - Circulation Element
  - Safety Element (Adaptation)
  - Conservation Element
- Or Design New Elements…
  - Climate Change Element?
  - Sustainability Element?
  - Land Use AND Circulation Element?
- Forthcoming CAPCOA Guidance
  - Integrating Climate Change into General Plans

Climate Action Plans

- Inventory of jurisdiction's emissions and projected emissions
- Evaluation of regional role
- Realistic reduction goals/AB 32
- Specific policies and programs
  - Green Building Ordinance
  - Municipal operations (fleets)
  - Investment in public/alternative transportation
  - Criteria for land use project approvals
  - Renewable energy portfolio standards
  - Advanced Recycling

Energy Efficiency Programs

- Austin, TX Energy Green Building Program:
  - Comprehensive program designed to encourage using sustainable building techniques
- City of Seattle, WA Green Building Program
  - Customized tools and assistance to incorporate green building techniques
- San Francisco, CA
  - Incentives , direct installation and technical assistance; expand education and outreach and strengthened codes. Estimated CO2 reduction of 801,000 tons annually.
- City of Boulder, CO Greenhouse Tax
  - Based on electrical usage. Fund implements Greenhouse Gas reduction programs.

Renewable Energy: Examples

- California Million Solar Roofs Program
- California Solar Water Heater Program
- Residential Solar - Berkeley, CA
  - New tax district to finance solar energy systems through property taxes.
  - City provides money for installation and material costs, homeowners pay back at a fixed rate over 20 years.
  - Residents pay about $180 a month through property tax bills for a typical$22,000 solar-electric system.
- Fontana SCE Project

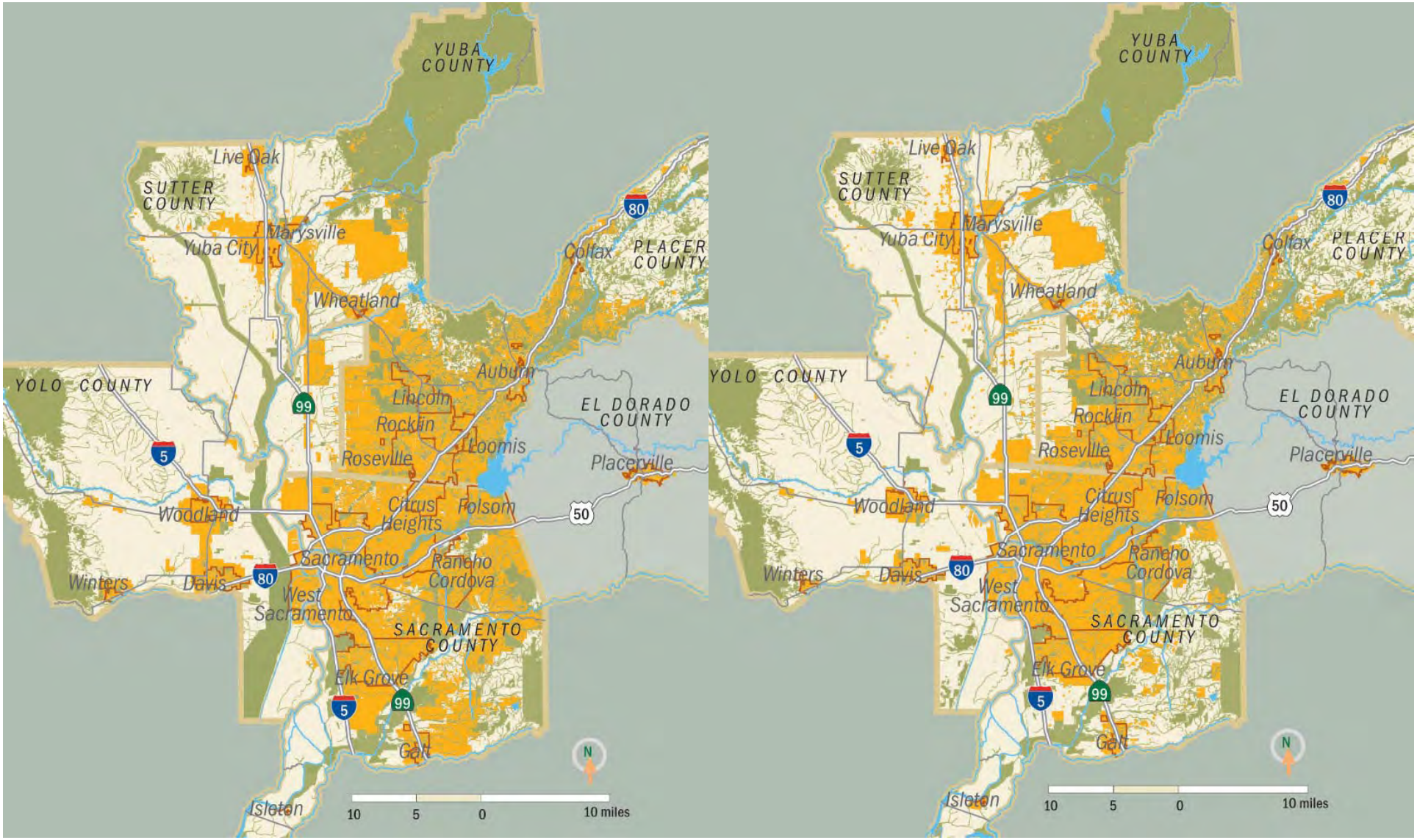
Land Use and Transportation

- Promote high density and in-fill development through zoning regulations
- Provide incentives and bonuses for development in downtown areas and near public transit
- Link transportation and land use policies

Land Use and Transportation

- "*Reduction of emissions from cars depends on a three-legged stool: improved vehicle efficiency, cleaner fuels, and a reduction in driving*"
  - (Reid Ewing, Research Professor "Growing Cooler: The Evidence on Urban Development and Climate Change" at the National Center for Smart Growth, University of Maryland, The Urban Land Institute, 2007)
- Local and Regional Governments are the key to VMT reduction
- VMT Reductions will not be easy but are a key long-term reduction strategy

Land Use Patterns Matter



Land Use Patterns Matter

- Sacramento Blueprint Scorecard in 2050
  (Base Case vs. Blueprint)
  - Transportation Modes

Auto:	92% vs. 84%
Transit:	1% vs. 3%
Walk or bike:	7% vs. 13%
VMT/household/day:	47 miles vs. 35 miles
Household Daily Travel:	91 minutes vs. 67 minutes

  - Carbon Dioxide Emissions
    14% less with Blueprint

Sacramento Area Council of Governments, Blueprint 2050

Acting Specifically On Transportation

- Promote commute trip reduction
- Restrict idling at public facilities
- Improve traffic signal synchronization
- Bring car sharing programs to community
- Develop and implement bicycle and pedestrian infrastructure programs
- Plan for transit for the long run

Acting Specifically On Transit

- Fast, frequent, and comfortable transit service will increase ridership, as will high parking charges and/or constrained parking supply.
- The availability of free or low-cost parking is a major deterrent to transit ridership.
- Successful ridership strategies include: TOD transit pass programs Parking reductions, and car-sharing programs.

Effects of TOD on Housing Parking and Travel, Transit Cooperative Research Program, August 2008

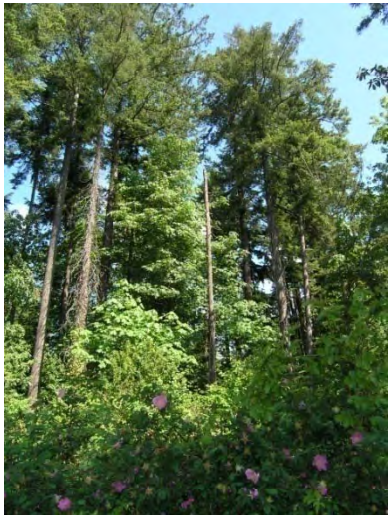
Transportation - Examples

- Marin County
  - Safe Routes to Schools Promotes walking and biking to schools; reduced single student car trips by 13 %, saving over 4,250 one-way trips/day.
- Burlington
  - 15 transportation strategies could reduce VMT by 17 million to 30 million depending on aggressiveness.
- San Francisco
  - 6 transportation strategies (increase transit, increase ridesharing, bicycling and walking, employer base trip reduction, discourage driving, increase clean air vehicles): Annual CO2 reduction 963,000 tons.

Water Measures

- Water sector is the largest user of energy in the state
  - 19% of all electricity consumed in the state
  - 30% of nonpower plant–related natural gas use.
  - Southern California = 2 to 3 times Northern California average water-energy use (per gallon water delivered – difference is all in transport of water).
- Water Measures for GHG Reductions
  - Water Conservation
  - Water Recycling
  - Water Quality Protection = More Local Water Supply

Urban Forestry



- US Forest Service:
  - Trees properly planted around buildings can reduce air conditioning needs by 30% and save 20 – 50% in energy used for heating
- Los Angeles:
  - Million Tree initiative (see http://www.treesearch.fs.fed.us/pubs/29402)
  - 764,000 to 1.27 million tons over 35 years
  - 22,000 to 36,000 tons annually
- San Diego:
  - Plant 5,000 shade trees annually for 20 years to reduce urban heat island effect
- Seattle:
  - Restore 2,500 acres of forested city park lands by 2025 and add 649,000 trees citywide over 30 years.

Waste Reduction

- Establish/expand recycling programs
- Public outreach to increase effectiveness of existing programs
- Develop/implement solid waste reduction programs

Offsets and Other Mechanisms

- Offsets
  - Implement off-site project to reduce emissions elsewhere such as:
    - Reforestation in deforested areas
    - Methane gas digesters for farming (natural gas from….natural gas)
    - Retrofits of existing homes
  - "Additionality" – e.g., it would not happen without the additional funding
  - Question of location
    - In California?
    - In United States?
    - Global?
  - Environmental Justice Concerns

Offsets and Other Mechanisms

- Carbon Impact Fees
  - Could be used for local projects that reduce existing emissions
  - Could be pooled regionally or state-wide to implement reduction efforts
  - Could have a combined fee and rebate program ("feebate") based on GHG efficiency
- Carbon Banks
  - Garcia River Forest
    - http://www.conservationfund.org/west/california/garcia
  - Lompico Forest Carbon Project
    - http://www.sempervirens.org/lompicocarbonproject.htm
  - Vintage Dairy
    - http://www.allbioenergy.com/
  - Others:
    - http://www.climateregistry.org/reserve.html

Forest Management Offset Protocols

- PCAPCD is leading development of forest management offset project protocols
  - Biomass waste for energy (ARB is reviewing for approval)
    - Use of waste biomass (forest slash) for energy as alternative to disposal through open burning or in field decomposition and decay
    - Renewable energy displaces fossil fuel, reduces CH4 from pile burn or decomposition
  - Forest fuel treatment (under development)
    - Wildfire reduction – size, intensity – reduction of loss of carbon in wildfire
    - Forest growth rate enhancement – increase in tree carbon sequestration
- Provide an option as the offsite mitigation for a land use project
  - GHG emission reduction is quantitative and locally verifiable
- In collaboration with USFS, CalFire, CEC, and ARB

Project Mitigation

- Applying all the strategies just discussed
  - Energy
    - How can the project use energy efficiently?
    - How can the project use renewable energy?
  - Transportation and Land Use
    - How can the project reduce VMT?
  - Water
    - How can the project lower water use?
  - Waste
    - How can the project minimize waste?
  - Urban and rural forestry
    - How can the project preserve existing forests/trees?
    - How can the project increase forests/trees?
  - Offsets
    - PCAPCD has a voluntary Offsite Mitigation Policy, approved by the APCD Board of Directors

Resources for Mitigation Measures

- ICLEI, www.iclei.org
- LEED Building Standards
- Institute for Local Government, www.ca-ilg.org
- CAPCOA, CEQA and Climate Change, http://www.capcoa.org/index.php
- Climate Action Team Report (March 2006)
- CA Caltrans Climate Action Program
- Attorney General List of Mitigation Measures (see http://ag.ca.gov/globalwarming/)