MEETING NOTICE
AND AGENDA

ENERGY WORKING GROUP
The Energy Working Group may take action on any item appearing on this agenda.

Thursday, June 26, 2008
11:30 a.m. to 1 p.m.

SANDAG, Seventh Floor Board Room
401 B Street, Suite 800
San Diego, CA 92101-4231

Staff Contact: Brian Holland
(619) 699-6915
bho@sandag.org

AGENDA HIGHLIGHTS

• DRAFT REGIONAL ENERGY STRATEGY: TRANSPORTATION FUELS BACKGROUND
• SDG&E SUMMER PREPAREDNESS
• DRAFT CLIMATE ACTION PLAN: SECTION 1
• CITY OF CHULA VISTA DRAFT IMPLEMENTATION PLANS FOR CLIMATE CHANGE

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To request this document or related reports in an alternative format, please call (619) 699-1900, (619) 699-1904 (TTY), or fax (619) 699-1905.
1. WELCOME AND INTRODUCTIONS

+2. SUMMARY OF MAY 22, 2008, ENERGY WORKING GROUP (EWG) MEETING

The May 22, 2008, meeting summary is attached for the EWG review and approval.

3. PUBLIC COMMENT AND COMMUNICATIONS

Members of the public who would like to address the EWG on a topic not on the agenda should do so at this time.

+4. CALENDAR OF SANDAG ENERGY PLANNING PRODUCTS

At the May meeting, EWG members requested a project calendar. This calendar contains dates for deliverables from SANDAG to the Energy Commission as part of its energy planning contract.

+5. DRAFT REGIONAL ENERGY STRATEGY: TRANSPORTATION FUELS BACKGROUND

Staff will present a draft section of the Regional Energy Strategy Update on trends and forecasts associated with transportation fuels in the San Diego region. EWG members are requested to provide comments and/or revisions.

6. SDG&E SUMMER PREPAREDNESS

SDG&E will provide an update on the summer energy outlook. Adequate resources are available to maintain reliability this summer, subject to normal weather conditions. However, the CAISO has indicated a higher probability of Stage Emergencies for Southern California this summer and that conservation and demand response is critical to easing strain on grid during extremely hot weather.

+7. DRAFT CLIMATE ACTION PLAN: SECTION 1

Staff will present draft chapters of the SANDAG Climate Action Plan. Section 1 provides background on climate science and policy and lays out emissions forecasts and reduction scenarios for the transportation sector. EWG members are requested to provide comments and/or revisions.
<table>
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<tr>
<th>ITEM #</th>
<th>RECOMMENDATION</th>
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<tr>
<td>8.</td>
<td>RPS RENEWABLE ENERGY UPDATE INFORMATION</td>
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<td>SDG&amp;E will provide an update on efforts to meet the State Renewable Portfolio Standard (RPS) mandate that requires 20 percent of the energy delivered to customers come from renewable sources by 2010, and an update on local renewable projects.</td>
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<td>CITY OF CHULA VISTA DRAFT IMPLEMENTATION PLANS FOR CLIMATE CHANGE INFORMATION</td>
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<td>City of Chula Vista staff is seeking comment from EWG members on its draft implementation plans for seven climate change measures adopted by City Council in April 2008.</td>
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<td>10.</td>
<td>SCHEDULING AGENDA ITEMS FOR FUTURE MEETINGS DISCUSSION</td>
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<td>EWG members are invited to suggest topics for the upcoming July 24, 2008, meeting. The agenda will include an update on the Sustainable Region program.</td>
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<td>ADJOURN</td>
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+ next to an item indicates an attachment
SUMMARY OF MAY 22, 2008, ENERGY WORKING GROUP (EWG) MEETING

AGENDA ITEM #1: WELCOME AND INTRODUCTIONS

Energy Working Group (EWG) Chair Carrie Downey, City of Coronado, called the meeting to order at 11:39 a.m. and welcomed the group. She hoped to start future meetings right at 11:30 a.m., which would require everyone to get to the meeting on time.

Marty Hunter, San Diego Imperial-Labor Councils, asked how the Working Group's attendance policy was being enforced. As a new chair for the group, Ms. Downey asked to table her answer until she has a chance to review the policy and its implementation. She also stated that the Board would be reviewing working group policies on June 13.

AGENDA ITEM #2: SUMMARY OF FEBRUARY 28, 2008, MEETING

Ms Downey asked working group members to look over the meeting summary and to approve it if there were no changes.

Paul O'Neal, North County Economic Development Council, motioned to approve the minutes. Tim Hemig, NRG Energy, seconded the motion, which passed without opposition.

AGENDA ITEM #3: PUBLIC COMMENT AND COMMUNICATIONS

Members of the public were given the opportunity to address the EWG on a topic not on the agenda.

No public comments were made.

AGENDA ITEM #4: REGIONAL TRANSPORTATION PLAN ENVIRONMENTAL IMPACT REPORT SETTLEMENT AGREEMENT

Rob Rundle, SANDAG, informed the group that a settlement agreement had been reached with parties alleging deficiencies in the Environmental Impact Report for the Regional Transportation Plan (RTP), which was approved by the Board in November. A complete copy of the agreement was included in the agenda packet. As part of the settlement, SANDAG has agreed to undertake a number of initiatives, including participation in the Downtown Transportation Plan and the formation of an urban core transit plan. These projects will complement the planning SANDAG is already doing in climate change and transportation and will feed into future updates to the RTP.
AGENDA ITEM #5: SUSTAINABLE REGION PROGRAM UPDATE

Susan Freedman, SANDAG, said that the four cities participating in the 2007-2008 expanded pilot program were Coronado, Imperial Beach, Poway, and Solana Beach. Both CCSE and SDG&E would join SANDAG next month for a full presentation on progress to date. Also, SANDAG was receiving a Local Government Partnership with SDG&E that would continue the Sustainable Region program from 2009-2011.

Jennifer Porter, CCSE, said that the 2007-08 program was a continuation of the successful pilot in Carlsbad, where improved efficiency measures helped reduce utility costs by more than 5 percent.

When asked whether Chula Vista was participating, Ms. Freedman said that Chula Vista and the City and County of San Diego have been early participants in SDG&E energy efficiency programs; therefore, they have their own energy staff, funding, and programs. The SANDAG program is to assist member agencies that do not have the technical staff or program funding to develop energy management plans or participate in energy efficiency programs yet. SANDAG hopes to provide expertise and energy education to cities in the region that otherwise would not be able to take part in the energy-saving programs available to them.

AGENDA ITEM #6: DRAFT ALTERNATIVE FUELS INFRASTRUCTURE STUDY

Brian Holland, SANDAG, said that a draft of the Alternative Fuels Infrastructure study had recently been submitted to the California Energy Commission (CEC) as per SANDAG’s contract with the Energy Commission. The study will form the core of the Alternative Fuels Toolkit for Local Governments, which will give municipalities the tools to adopt alternative fuels within their vehicle fleets. A complete copy of the draft study was included in the agenda packet. He gave a detailed presentation on the findings of the study and solicited responses from the EWG. Members also could submit written comments at a later date for the final draft. Development of the draft was vetted by the ad hoc advisory group on alternative fuels.

During the presentation, several questions were asked and comments made. Ms. Downey asked if there was a link between SANDAG development plans for smart growth and this plan for fuel infrastructure. Mr. Holland said that the focus had been on municipal fleets, but it could be expanded to encompass some larger SANDAG planning projects.

Laura Hunter, Environmental Health Coalition, expressed concern that solar was not mentioned in the section of electricity. Solar has great potential to charge vehicles or contribute to a more sustainable future. And vehicles could also feed power back into a smart grid. Mike Evans, San Diego Regional Chamber of Commerce, said that off-peak generation would be a beneficial reciprocal technology with plug-in vehicles. He also wondered if pricing information for various technologies could be included and could we look at scenarios to see how increasing the fleets would affect our gas and electric infrastructure.

Ted Stern, San Diego Renewable Energy Society, wanted to clarify that hydrogen is not a clean energy source with only water vapor. Hydrogen is an energy storage medium that he says comes from potentially dirty sources. Hydrogen produced from renewable sources like solar PV is possibly clean, but right now it isn’t.
Henry Abarbanel, City of Del Mar, said that well-to-wheel analysis is a good idea, and the studies put out by the Argon National Lab are the best. Based on the Argon studies, he says that the U.S. and the EU both recommended against the use of corn-based ethanol since it yields less energy than what is required to make it. Fuels cells also have toxic wastes from the use of certain catalysts and, along with the limited supply of hydrogen, are not recommendable.

Dr. Abarbanel also asked if the draft report had been previously vetted by the EWG before being submitted to the CEC. Finding that it had not, he motioned that no report bearing the name of the EWG be distributed outside of SANDAG without being vetted by the EWG. Mr. O’Neal seconded the motion.

Ms. Downey clarified that the reports bear the name of SANDAG, not the EWG. Rob Rundle, SANDAG, said that the draft plan was being developed in partnership with the CEC and that the CEC contract did not require that the EWG approve deliverables. It did suggest that the EWG should provide input on the deliverables, which this agenda item has given members the opportunity to do. Dr. Abarbanel said that he felt it was embarrassing that a report which, in his opinion, contained fundamental errors be sent out with SANDAG’s name on it. He felt that, if the report had been vetted for the group before submittal, these errors would have been caught.

Ms. Downey said that this discussion really questions what the role of the EWG is and should be. The EWG was formed as an advisory group, not a policy committee. She said that it would be great for the group to look at everything SANDAG is doing, but that the schedule of when deliverables are due and when the EWG meets do not always synchronize. The expertise that the working group provides for free is highly valuable and SANDAG should take advantage of those who donate their time to the EWG. She said that on June 13, the SANDAG Executive Committee will be considering how to structure working groups, including the EWG, so that they are best utilized.

Dave Carey, Port of San Diego, said that he did not support the motion because it is important to give staff enough flexibility to communicate with CEC staff without road blocks.

Rebecca Jones, City of San Marcos, asked what the normal process is for working groups to handle documents like this study. Ms Downey said that she agreed that the EWG should look at things and make corrections, but that it needed to be scheduled so that the working group had time to review things, and deadlines for the deliverables could still be made.

Mr. Holland said that there was opportunity for significant comments and revisions before the final version of the report is submitted in October 2008. There would be plenty of time to integrate feedback from the working group, the Ad-hoc alt-fuels advisory group, and from members of the public.

Donna Frye, City of San Diego, said that although revisions could be made, she was concerned that the draft sets an agenda and a tone without the group’s input. If there was a schedule of deliverables, the group could have reviewed the draft at the last meeting.

Dr. Abarbanel said that SANDAG had only recently begun dealing with the CEC and CPUC, and should utilize all the expertise it has to make sure the best products are submitted if it wants to build a reputation with these organizations. He wants to prevent having to extensively revise things by making sure we are right every time. He said that he would withdraw his motion since the issues
he wished to address had been discussed, although he hoped that Ms. Frye’s request for a list of deliverables would be provided so they could be put on the docket.

Dr Abarbanel said that AB 32 mandates and the necessity of reducing GHG emissions may not come out strongly enough in the document. He also suggested that SANDAG get in contact with Argon National Laboratory, who he feels produces the best well-to-wheel analysis of various fuels.

Ms. Downey said that members with additional detailed comments could send them directly to Mr. Holland.

Heather Honea, SDSU, asked what the ultimate objective of the plan was. Mr. Holland said that the plan should ultimately recommend locations for the development of alternative fuels infrastructure.

Claire Spielberg, MTS, asked if there would be any economic incentives for private fueling stations to open to the public. MTS operates a number of natural gas fuels facilities for its fleets. Mr Holland said the full toolkit will include things like financing strategies. The infrastructure plan was specifically looking at geographic locations.

Joe Bessler, public, said his company, Silverwood Energy, was a distributor of large hydrogen fuel cells and that he would like to address some misconceptions about fuel cells. There are various technologies that are used in fuel cells and different technologies have different uses and impacts. The 1.5 mw fuel cell installation at the Sheraton Harbor Island is currently the largest in the world, and its multi-carbonate catalyst does not require the same kind of toxic waste disposal as older alkaline based ones do. Although hydrogen does require energy to manufacture, there are environmentally friendly ways to produce gas. UCSD will be powering a fuel cell from waste water treatment gas. Although automotive fuel cells may be a great technology in the future, stationary fuels cells are a mature technology today.

AGENDA ITEM #7: MAY 2008 DISTRIBUTED GENERATION AND RENEWABLE RATE STRUCTURE

Joe Valaquez, SDG&E’s Director of Commercial and Industrial Services, gave an update on the new DG-R rate for commercial customers. SDG&E had worked with customers and the CPUC and found a rate to benefit solar customers that everyone could agree on.

For large commercial customers, the previous rate was divided into demand charges, which cover infrastructure costs like transmission lines and sub-stations, and generation charges, which cover the cost of power. The rate is based on what it actually costs to serve customers. The customers with solar systems could offset the energy charges, but still paid a demand charge based on their peak usage.

The new DG-R rate structure eliminates the peak demand charge and reduces the non-coincident demand charge by 50 percent. The costs have been shifted to the energy charge, which can be offset by PV generation. Mr. Velazquez showed several slides showing how rates would change for an average customer. Customers saw a 10 to 66 percent savings on their bill, depending on their use and system, with a 30 percent savings being about average. Commercial customers need to opt-in to the new rate and it is available to accounts with up to 2 MW of demand and 10 percent of load being met by solar or other distributed generation technologies like fuel cells.
Mr. Velazquez said he hoped this rate would encourage those organizations that had held off on installing solar to now see greater benefits by installing solar. He also clarified that the rate is still based off of net metering, not selling back to the grid. However, generation on peak is credited with the higher on-peak rate which covers more off-peak power. Credit can accrue for up to 12 months. SDG&E intends to put a tool online so customers can look at their own usage and calculate how the rate will benefit them under different scenarios. Commercial customers without solar may see an increase in rates.

Mr. McAllister said that some customers did not do due diligence and did not see much benefit from solar since they did not fully understand their rates. CCSE has been helping customers to understand their rates, and customers with generation that covers between 25 to 40 percent of their demand should see substantial benefit from this new rate. A number of customers have contacted CCSE about this new rate and it should encourage greater adoption of solar, but that there are other initiatives that could be undertaken to encourage even greater adoption.

Cecilia Aguillon, Kyocera Solar, said the solar energy industry has been waiting for this kind of rate for a long time. PG&E has had a rate like this since the 1980s, and it has encouraged greater solar adoption there. She said she hoped that SDG&E would do more for residential customers, including time-of-use metering.

Mr. McAllister said that SDG&E actually has one of the highest rates of net metering as a percentage of peak demand in the State, but has less in absolute numbers since it is a smaller territory. Although SDG&E top tier rates may be lower than for other utilities, it is still the best investment to size a PV system to cover the top tiers. Hopefully, more advanced metering infrastructure will give customers more information and allow better time-of-use rates.

**AGENDA ITEM #8: SUBCOMMITTEE UPDATE: LARGE-SCALE UTILITY OWNED PHOTOVOLTAIC PROGRAM**

Mr. O'Neal said that the subcommittee meeting had been poorly structured and the committee was not able to complete a thorough analysis of the proposals. The next subcommittee meeting would revisit the issue, receiving a presentation from Southern California Edison and analysis from Mike Evans and Bill Powers.

**AGENDA ITEM #9: SCHEDULING AGENDA ITEMS FOR FUTURE MEETINGS**

Ms Downey said she would make sure that there was a list of deliverables for the CEC contract and invited members to contact her with any other suggestions.

**AGENDA ITEM #10: ADJOURN**

The meeting was adjourned at 1:36 p.m. The next meeting will be June 26, 2008.
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OTHERS
Cecilia Aguillon, Kyocera Solar
Joe Bessler, Silverwood Energy
Alexandra Hart, IBEW 569
Julie Gelfat, IBEW 569
Cari Dale, City of Carlsbad
Mary Ann Kempczenski, City of San Diego
Tom Blair, City of San Diego
Emery McCaffery, Ecology & Environment
Jennifer Porter, CCSE
Sephra Ninow, CCSE
Bob Resley
Joe Velasquez, SDG&E
Susan Freedman, SANDAG
Brian Holland, SANDAG
Kevin Wood, SANDAG
CALENDAR OF SANDAG ENERGY PLANNING PRODUCTS

Attached is a spreadsheet of deliverables to the California Energy Commission under SANDAG’s contract to conduct energy and climate planning activities. The spreadsheet will be regularly included in monthly EWG agendas as reference.

Attachment 1: SANDAG Energy Planning Program Deliverables

Key Staff Contact: Susan Freedman, 619-699-7387; sfr@sandag.org
<table>
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<th>SANDAG Energy Tasks—Energy Commission Contract</th>
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<td>1A. REGIONAL ENERGY STRATEGY</td>
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<td>1.1 Report on existing RES and additions for future RES</td>
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<td>1B. REGIONAL CLIMATE CHANGE FRAMEWORK</td>
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<td>2. SUSTAINABLE REGION PROGRAM</td>
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<td>2.1 Report on research and outline of action plan and toolkit</td>
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<td>2.3 Program Implementation Plan (ongoing funding)</td>
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OWP 3003002
Updated 5/16/08
## 3. ALTERNATIVE FUELS TOOLKIT

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### 3.1 Roster of completed steering Committee

- Jun

### 3.2 Scope of work outlining process and outcomes of study

- Jul

### 3.3 Draft study

- Aug

### 3.4 Steering Committee Comments

- Sep

### 3.5 Transcript from workshop

- Oct

### 3.6 Final study

- Nov

### 3.7 Final toolkit sent to SANDAG local governments

- Dec

### 3.8 Plan for outreach to transfer lessons learned

- Jan

Updated 5/16/08
Attached is a draft section of the Regional Energy Strategy (RES) Update on trends and forecasts associated with transportation fuels in the San Diego region. EWG members are requested to provide comments and/or revisions.

The RES draft report is a deliverable of the SANDAG energy planning program to the California Energy Commission (CEC). The draft will be submitted to the CEC on June 30, 2008.

Attachment 1: Transportation Fuels Section for Regional Energy Strategy Update

Key Staff Contact: Brian Holland, 619-699-6915; bho@sandag.org
TRANSPORTATION FUELS IN THE SAN DIEGO REGION:

EXISTING CONDITIONS, TRENDS, AND FORECASTS

June 30, 2008
The 18 cities and county government are SANDAG serving as the forum for regional decision-making. SANDAG builds consensus; plans, engineers, and builds public transit; makes strategic plans; obtains and allocates resources; and provides information on a broad range of topics pertinent to the region’s quality of life.

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As of May 30, 2008
TRANSPORTATION FUELS IN THE SAN DIEGO REGION: EXISTING CONDITIONS, TRENDS, AND FORECASTS

Transportation fuels account for a large portion of the energy used in the San Diego region, a portion that grows larger every year. Energy is required to provide mobility for a growing number of people and goods in the region and reliable and affordable access to transportation fuels is fundamental to the region’s quality of life and economic vitality. Since adoption of the 2003 Regional Energy Strategy (RES), concerns have mounted about the environmental, economic, and national security impacts of oil dependence. For the 2008 RES, opportunities exist to provide enhanced mobility in the region while mitigating these impacts and adapting to new and emerging realities in the transportation fuel sector.

The 2008 RES will present policies that move the region forward on a more affordable, sustainable, and resilient path over the coming decades. This chapter lays a foundation for further policy planning by cataloguing existing conditions, trends, and forecasts in the transportation fuel sector.

TRAVEL DEMAND

Travel behavior is influenced by many factors, including demographics, land use, lifestyle, the economy, employment locations, and work practices. Travel demand can be expressed by the number of motorized trips taken and by the number of miles traveled (vehicles miles traveled, or VMT). The region’s population currently makes an estimated 16.7 million trips daily, an increase of approximately 85 percent over 1990 levels. These trips account for over 85 million vehicle miles traveled per day on the region’s roads.

Trips and VMT are both increasing faster than population growth, resulting in ongoing increases in per capita travel demand. By 2030, the region’s population is expected to travel 111 million miles daily, an increase of 31 percent over current (2006) conditions.

Like most major metropolitan regions around the country, the San Diego region has seen a gradual decline in commuting by carpool and transit in favor of driving alone. Between 1990 and 2000, the percentage of residents who drove alone to work increased, while commuting by all other modes decreased or stayed the same, though anecdotal information suggests that this trend may be moderating in light of recent gas price increases.

PASSENGER VEHICLE FUEL EFFICIENCY

Since 1975, the federal government has been responsible for regulating vehicle fuel efficiency through the corporate average fuel economy standards, better known as CAFÉ standards. Fuel economy is defined as the average mileage traveled by an automobile per gallon of gasoline (or equivalent amount of other fuel).
CAFÉ requires vehicle manufactures to maintain a minimum fuel efficiency, represented by miles per gallon, over their entire fleet of passenger vehicles and light trucks. CAFÉ was enacted in response to the 1973-74 Arab oil embargo and it had the goal of doubling the fuel economy of a 1974 model year car by 1985 (to 27.5 mpg). After some mild increases and decreases over the years, the CAFÉ standard has remained unchanged at 27.5 mpg since the 1990 model year. In 2007, President George Bush signed into law the Energy Independence and Security Act that would increase CAFÉ to 35 miles per gallon by 2020.

The California Air Resources Board (CARB) provides fuel efficiency assumptions for the California fleet in its Emissions Factor (EMFAC) air quality model. EMFAC uses a baseline average fuel efficiency figure of 25.1 miles per gallon (mpg) gasoline for the current model year light-duty vehicle fleet. Because earlier model year, less-efficient vehicles are on the road, average fuel efficiency across the entire light-duty fleet is lower at an estimated 20.5 mpg in 2006.

**FUELS AND INFRASTRUCTURE**

The following section evaluates the origins and current use of fuel in the region and identifies existing distribution and fueling infrastructure.

**Regional Gasoline and Diesel Consumption**

In 2006, the region consumed approximately 1.6 billion gallons of gasoline in on-road transportation. Under a business-as-usual scenario, annual gasoline consumption would increase to approximately 2.1 billion gallons in 2030.

Between 1990 and 2006, on-road diesel consumption increased 80 percent to 195 million gallons. By 2030, diesel consumption is projected to increase to approximately 241 million gallons under business-as-usual conditions. Gasoline and diesel provide the vast majority of transportation energy in the region.

**Fuel Origin and Distribution**

**PETROLEUM ORIGIN**

United States petroleum production peaked in 1970 at around 11.6 million barrels per day (mmbd), and domestic production has since declined steadily, to approximately 8.3 mmbd in 2006. The gap between domestic supply and demand has been increasingly filled by imports. In 2005, approximately 60 percent of California’s supply was produced in the United States, with 20 percent of the total supply originating in Alaska and 40 percent in California. Of the remaining 40 percent that was imported from abroad, the most significant sources were Saudi Arabia (14 percent of total supply), Ecuador (10 percent), Iraq (5 percent), and Mexico (3 percent).
The San Diego region does not produce any significant quantity of petroleum and, therefore, must rely on imports.

**GASOLINE ORIGIN AND DISTRIBUTION**

San Diego County is part of a larger fuel distribution region in the southwestern United States, centered around the Los Angeles refinery center. The region—which includes counties in Southern California, as well as exports to Arizona, New Mexico, and parts of Nevada—is supplied by refineries in Los Angeles and by imports of finished gasoline and blending components received at the Port of Los Angeles. Gasoline is imported from Washington State, Gulf of Mexico states, and foreign sources, predominately in East Asia and Western Europe. California is not connected by pipeline to other oil refining centers, so all imports must arrive by ship. Out-of-state imports account for approximately ten percent of gasoline consumed in California, with the remaining 90 percent refined in-state. No refineries are found in the San Diego region.

All gasoline delivered to the San Diego region arrives through one Kinder Morgan pipeline that originates in the Los Angeles refinery center and ends at the Kinder Morgan terminal in Mission Valley.

**FUELING STATIONS IN THE REGION**

From the Mission Valley terminal, gasoline is trucked to fueling stations throughout the County. As of 2002, there were approximately 761 fueling stations in San Diego County, resulting in a lower density of stations than the other major metropolitan areas of California.

**Alternative Fuels**

Alternative fuels are derived from sources other than petroleum. Several types of alternative fuels are used in the region, and they account for approximately one percent of regional transportation fuel consumption. The most commonly used alternatives are natural gas, electricity, ethanol, and biodiesel. Hydrogen also is viewed by some as a promising long-term alternative fuel. This section describes existing fuels, infrastructure, and alternatively-fueled vehicles in the region.

**NATURAL GAS**

Natural gas is used as a transportation fuel in two forms: compressed natural gas (CNG) and liquefied natural gas (LNG). In San Diego, CNG fuels a large proportion of transit buses and LNG fuels Waste Management refuse haulers. Total regional CNG consumption in transportation applications in 2006 was approximately 10,100,000 therms, or 8,080,000 gasoline gallon equivalents (GGE). Consumption in 2008 is expected to approach 9 million GGE. In addition, 1.2 million GGE of LNG was consumed by City of San Diego and Waste Management refuse hauler fleets in 2006.
A large portion of this fuel is consumed by buses operated by the region’s two transit agencies, the Metropolitan Transit Service (MTS) and North County Transit District (NCTD). Both agencies exclusively purchase CNG buses, with approximately 75 percent of the MTS fleet and approximately half of the NCTD fleet operated on natural gas. Other primary consumers of CNG for transportation purposes include the Poway and Vista school districts, military facilities, and airport ground transportation fleets, such as taxis and shuttle buses.

Three public CNG fueling stations are found at San Diego Gas & Electric (SDG&E) service centers in Kearny Mesa, Miramar, and Carlsbad. CNG also is publicly available at the Chula Vista and Poway school district facilities and at two commercial fueling stations—Pearson Fuels in City Heights and a Clean Energy/Shell facility on Pacific Highway near San Diego International Airport. An additional CNG station is scheduled to open to the public at a NCTD facility in Oceanside in 2008.

**ELECTRICITY**

Most electricity used for regional transportation purposes is consumed by the San Diego Trolley and the light rail system operated by Metropolitan Transit System (MTS). The Trolley consumed approximately 28 million kilowatt hours (kWh) of electricity in 2006. This power is delivered through conventional electricity infrastructure including transmission and distribution lines to electrified overhead wires.

Two additional vehicle classes rely on electricity as fuel: neighborhood electric vehicles (NEVs) and electric off-road vehicles like some construction equipment and airport ground support equipment. Currently, these vehicles are limited in number, but there is room for growth. University of California San Diego (UCSD) maintains a fleet of approximately 350 electric vehicles for facilities management and other operations.

A re-emerging technology is the electric passenger vehicle. Battery electric vehicles (BEVs) that run only on electricity were available for lease between 1997 and 2003 in California but were phased out for various reasons. As many as 20 regional facilities offer operational, publicly-accessible electric charging stations for light-duty passenger vehicles. Almost all are located at San Diego International Airport, UCSD, Scripps medical facilities, and Costco locations. However, because electric cars are not widely utilized, these stations do not receive much use.

With the popularity of hybrid passenger vehicles like the Toyota Prius, automakers are developing plug-in hybrids that can be plugged into an ordinary home wall socket. Other manufacturers are developing a new generation of BEVs. To prepare for this transition, SDG&E has a clean transportation program that is investigating the impacts of plug in hybrids on the electricity grid.

**ETHANOL**

Ethanol is an alcohol-based fuel derived from organic feedstocks, including corn and sugar cane. Regular California gasoline currently contains 5.7 percent ethanol. For higher blends, the typical blend type for passenger vehicles is a mix of 85 percent ethanol and 15 percent gasoline called E85. There are no fleet-based E85 fueling stations in the region, and public access to fueling stations is quite limited. Only the Pearson Fuels station on El Cajon Boulevard currently offers E85. However, two new E85 pumps will soon be added in Carlsbad and Oceanside under a contract between
Pearson Fuels and the California Energy Commission (CEC). Currently, between 7,000 and 14,000 gallons of E85 are sold monthly in the region, depending on the price differential between E85 and gasoline.

Despite the constrained availability of E85, many “flex-fuel” vehicles are found in the region, capable of running on either gasoline or E85. CEC staff estimate that one to two percent of the California passenger vehicle fleet consists of flex-fuel vehicles, most of which are American-made light-duty trucks and sport utility vehicles. E85 is not commonly used in heavy- or medium-duty fleet applications, due in part to the lower energy intensity of the fuel compared to biodiesel or natural gas.

**BIODIESEL**

Biodiesel is a non-petroleum based diesel fuel derived from vegetable oils and animal fats. It is used on a limited basis in personal vehicles, and public fueling stations are located at Pearson Fuels in City Heights and at the Soco Group petroleum distribution facility in El Cajon. Biodiesel is a more common fuel for fleets in the region. The United States Navy and Marine Corps are two of the largest users of biodiesel in San Diego County. The fuel also is used in the City of Carlsbad fleet, in the diesel bus fleet at UCSD, and in Hornblower Cruises vessels that provide tours of the San Diego harbor and coast. UCSD imports approximately 10,000 gallons of biodiesel monthly from an Orange County distributor, while other fleets are served by Soco Group, which sells approximately 25,000 gallons monthly in the region.

Biodiesel is currently produced regionally by New Leaf Biofuels, which collects waste oil from local restaurants and processes it into pure biodiesel (B100). Current 2008 production stands at approximately 13,000 gallons per month. The company is currently developing a new processing facility, to be completed in summer 2008, with a maximum production capacity of 140,000 gallons per month. This fuel will be sold to petroleum distributors for blending into other biodiesel mixes, primarily B20 (20 percent biodiesel—80 percent diesel).

**HYDROGEN**

Hydrogen can be used as a transportation fuel in fuel-cell vehicles, which generate electricity from hydrogen. Hydrogen is a mid- to long-term alternative transportation fuel option being researched through the assistance of President Bush and Governor Schwarzenegger’s Hydrogen Highway programs. Much Department of Energy funding has been dedicated to hydrogen technologies and research since 2000. However, the technology is still in the research phase, and no fuel-cell vehicles are operated in the region.

One hydrogen fueling station is accessible to the public at the City of Chula Vista Corporation Yard. The station was installed when the City began leasing a fuel-cell vehicle from Honda in 2004. However, the station is not commonly used, due to an absence of fuel-cell vehicles on the road.
TRENDS AND FORECASTS

The following section identifies regulatory and market trends in the transportation fuel sector and presents medium-term and long-term forecasts for gasoline and oil supply, demand, and prices.

Regulatory Trends

Transportation fuels have received a great deal of attention from decision-makers and regulators in recent years. Concern for energy security and climate change has driven much of the policymaking, which has mostly addressed alternative fuels, fuel efficiency, and reducing GHG emissions.

FEDERAL GOVERNMENT

Corporate Average Fuel Economy (CAFÉ) standards

As referenced earlier in this chapter, CAFÉ standards were enacted in 1975 to provide a minimum level of fuel efficiency across the fleet of each manufacturer’s passenger vehicles. The 2007 Energy Bill calls for CAFÉ standards to increase to 35 mpg in 2020.

2007 Energy Bill

In 2007, President George Bush signed into law the Energy Independence and Security Act. The Act calls for reductions in United States oil demand by setting a national fuel economy standard of 35 mpg by 2020. It also calls for increasing the supply of alternative fuel sources by setting a mandatory Renewable Fuel Standard requiring fuel producers to use at least 36 billion gallons of biofuel in 2022.

STATE OF CALIFORNIA

Assembly Bill 2076—Reducing Petroleum Dependence

Assembly Bill 2076 (Shelley) was signed into law in 2000, requiring CEC and CARB to develop and submit to the Legislature a strategy to reduce petroleum dependence in California. The joint agency report was adopted in 2003. The report recommends an increase in the use of alternative fuels to 20 percent of on-road transportation fuel use by 2020 and 30 percent by 2030.

Assembly Bill 1493—Motor Vehicle GHG Emissions Standard

Assembly Bill 1493 (Pavley) was signed into law in 2002, requiring CARB to develop GHG emission standards for passenger vehicles. CARB adopted the standards, known as the Pavley rules, in September 2004. The standard is to come into effect with 2009 model vehicles and would become more stringent incrementally until the 2016 model year. While the standards are intended to reduce carbon dioxide pollution (expressed in CO2 grams per mile), automobile manufacturers will comply primarily through improvements in vehicle fuel efficiency (expressed in miles per gallon, or mpg).
CARB estimates that the Pavley rules will result in an average passenger vehicle fuel efficiency of 36.6 mpg in 2016.

Implementation of the Pavley rules have been delayed by the United States Environmental Protection Agency (EPA), which must grant California a waiver under the federal Clean Air Act for the state to be able to implement the standard. California has brought a case against the EPA in federal court to obtain the waiver, and the outcome of this court action is uncertain at this time. However, for planning purposes, it is assumed that California will obtain its waiver and that the Pavley rules will be implemented on schedule.

**Executive Order S-3-05 and Assembly Bill 32—GHG Emission Reduction Goals**

Governor Schwarzenegger signed Executive Order (EO) S-3-05 in 2005, establishing a goal of reducing GHG emissions to 80 percent below 1990 levels by 2050. In addition to this long-term goal, a 2020 emissions goal was established in AB 32, the Global Warming Solutions Act of 2006. AB 32 requires that statewide GHG emissions be reduced to 1990 levels by 2020 and charges CARB with developing and implementing regulations in pursuit of this goal.

For additional discussion of climate change policy and the role of transportation in meeting climate change goals, refer to the SANDAG Draft Regional Climate Action Plan (RCAP).

**Bioenergy Action Plan**

Governor Schwarzenegger approved and released the Bioenergy Action Plan for California in July 2006. The plan offered specific biofuel adoption targets, as follows:

- 0.93 billion GGE in 2010
- 1.6 billion GGE in 2020
- 2 billion GGE in 2050

In addition, the following goals were established for share of in-state biofuels production:

- 20 percent produced in-state in 2010
- 40 percent in 2020
- 75 percent in 2050

**Low Carbon Fuel Standard**

Development of a Low Carbon Fuel Standard (LCFS) was called for under EO S-1-07 in January 2007. The standard requires fuel suppliers and distributors to reduce the carbon intensity (GHG emissions per unit of energy) by 10 percent by 2020. The standard utilizes a full fuel cycle analysis (“well to wheels”) for determining carbon intensity. In June 2007, CARB identified the LCFS as a “discrete early action measure” under AB 32, requiring that the regulation come into effect no later than January 1, 2010.
**State Alternative Fuels Plan**

The State Alternative Fuels Plan, called for under AB 1007 (Pavley), was adopted by the CEC in October 2007 and was incorporated into the CEC Integrated Energy Policy Report (IEPR) adopted in November 2007. The Plan provided several scenarios for alternative fuels market penetration based on the predominance of different fuel types. It established alternative fuels targets, strategies, and actions to increase the use of alternative transportation fuels in a manner that minimizes costs to California and maximizes the economic benefits of in-state production. The 2007 IEPR recommends updating the State Alternative Fuels Plan every two years to correspond with regular biennial IEPR updates.

The Plan included recommendations for metropolitan planning organizations such as SANDAG to:

- Assist local and regional government fleets to purchase alternative fuel vehicles and use alternative fuels in a phased-in policy by 2012.
- Establish quantifiable goals to reduce petroleum dependence and curb GHG emissions and establish metrics to measure progress toward meeting these goals. Initiate specific ordinances, zoning requirements, and planning regulations to enforce these reductions.

**Market Trends**

The most prominent market trend in the transportation fuel sector is the volatility and escalation in gasoline and oil prices over the past decade. The direction of these prices is of great importance to regional transportation planning agencies, since prices could exert a significant influence on travel behavior and demand for various types of infrastructure. While recent observations suggest that prices are beginning to have an effect on travel behavior, the nature of the relationship should continue to be monitored and evaluated going forward. In addition to depressing demand for automobile travel, high prices may strain the operating budgets of transit agencies, resulting in service cutbacks at precisely the time that services are most needed.

**GASOLINE PRICES**

The period from 2000 to 2008 saw significant volatility in gasoline prices, with an overall trend towards substantially higher prices at the pump. Prices for regular unleaded gasoline in California generally decreased in the early years of the decade, settling to a low of $1.10 in December 2001. Between December 2002 and March 2003, prices rapidly rose 63 cents to $2.15 per gallon, then declined again to $1.60 per gallon by the end of 2003. Since then, gasoline has steadily become more expensive. As of June 10, 2008, regular unleaded prices in San Diego County averaged $4.49 per gallon.
Gasoline prices are determined by four primary elements that help to explain recent price increases:

- **Petroleum costs.** Oil price is the single largest cost component in gasoline and diesel prices, accounting for between 42 and 56 percent of the price of California regular gasoline in 2007, and as much as 77 percent as of May 2008. For every one dollar increase of the cost of a barrel of crude oil, there is an average increase of about two and a half cents per gallon of gasoline.

- **Taxes.** Taxes on gasoline include a federal excise tax of 18 cents per gallon, a state excise tax also of 18 cents per gallon, and state and local sales taxes that depend on the price of gasoline. Typical state and local sales tax in San Diego County is 7.75 percent.

- **Refining costs and profits.** Refining costs include all costs associated with crude oil processing, oxygenate/ethanol, product shipment and storage, oil spill fees, depreciation, gasoline storage to cover refinery shortages. This element also includes the refinery profit margin.

- **Distribution and marketing costs and profits.** This element includes all costs associated with the distribution and retailing of motor fuel, as well as profits taken by the gasoline dealer.

The causes underlying volatility and escalation in gasoline prices since 2000 can be traced to several factors. Most fundamentally, gasoline has followed rising crude prices. Gasoline prices have also been impacted by insufficient refining and storage capacity, pipeline outages, and logistical expenses associated with the switch from methyl tertiary-butyl ether (MTBE) to ethanol as an oxygenate in California Reformulated Gasoline in 2003 and 2004.

Refinery outages are an unavoidable occurrence in the transportation fuel sector, and generally shortfalls can be covered through increased gasoline imports or increased activity at other regional refineries. However, refinery capacity growth in Southern California has not kept pace with gasoline demand growth in the southwestern United States, resulting in a tighter market in the event of an unplanned outage and an increasing reliance on gasoline imports. Even when imports can cover losses from a refinery outage, they may not arrive for several days, as California is not connected to other oil refining areas by pipelines and must rely on shipments to the Port of Los Angeles. The closest refiners that can produce California Reformulated Gasoline are in Washington State.

**PETROLEUM PRICES**

As noted above, the most significant determinant of gasoline prices is the price of oil, and both have been on an upward trajectory for several years. The spot price for West Texas Intermediate benchmark oil in June 2008 hovered around $130 per barrel (bbl), a doubling from June 2007 levels. In the ten years between June 1998 and June 2008, prices increased tenfold from $13/bbl. The following passages describe the dynamics of the oil market and the factors that may influence oil prices in the next two decades.
Global Market, Local Impacts

Oil prices have a tremendous effect on local gasoline prices and the local economy, but they are established in a global market. Neither oil companies nor governments have the exclusive power to “set” the price of oil. Rather, a price emerges from trading activity that balances supply and demand and clears the market of available oil. The oil market is affected by a wide variety of political, economic, technological, and geological influences that are beyond the control of federal, state, or local governments. It is critical that the region recognize the global forces that impact not only regional gasoline prices and travel demand, but also the prices of a broad spectrum of goods that are dependent upon oil, including food, building materials, petrochemicals and plastics, and imported items with higher embedded transportation costs.

Global Finance and Currency

Because oil is freely traded in a global market, it is subject to volatility and speculation. Many credible commentators have argued that investors moved their capital out of real estate and finance markets in the midst of the 2007-2008 real estate and credit crisis and invested in more stable commodities such as oil, thereby, pushing up prices. At the same time, concerns over oil supply led many to speculate on oil futures prices, essentially bidding up the price of oil. Finally, because oil is almost always priced in United States dollars, the depreciation of the dollar relative to other currencies has increased the dollar price and made oil more expensive for Americans.

Global Demand

Demand for a wide variety of products has grown at a rapid pace over the past several years, led by large industrializing nations such as China, India, and Brazil. Oil is among the most desired commodities in these nations, not only for the hundreds of millions of inhabitants that have become able to purchase automobiles, but for a wide variety of industries that depend on oil and refined products for process heat, electricity, chemical feedstocks, building materials, and transportation. Until recently, American demand growth also remained strong in the face of record high prices. Despite a slowdown in the United States in the first half of 2008, the rapid growth of the global economy continues to put upward pressure on oil prices.

Global Supply

In June 2006, global oil supply leveled off at 85.5 mmbd and remained on a plateau for 18 months, until December 2007. This pause in production occurred at a time of unprecedented demand growth and was a major factor in the run-up to record-high prices. The following sections provide some explanation for the stagnant supply conditions between 2006 and 2008.

Geopolitical Constraints

An increasing share of oil reserves and production is controlled by national oil companies, as opposed to private, investor-owned firms. All of the top ten reserves holders and 14 of the top 20 producers are nationalized firms. The concentration of oil production in state hands introduces an element of uncertainty that is not presented by private firms, as governments are capable of manipulating the market for political ends. One study found that more than 60 percent of world oil reserves are in countries where political conditions could constrain oil production.
Oil prices today include a “risk premium” that reflects the danger of supply interruption due to social or political unrest in important oil-producing regions such as the Middle East, Nigeria, Venezuela, and Russia. In an era of tight market conditions, any such interruption would put considerable upward pressure on global prices. These geopolitical risks and constraints are only likely to intensify over the coming years as available oil is increasingly concentrated in the reserves of national oil company and volatile regions.

**Escalating Production Costs**

The cost of drilling wells and extracting oil has followed an upward trajectory over the past several years, due to a combination of factors. Most importantly, remaining oil reserves are less accessible than in the past. In order to maximize returns, oil companies have historically exploited the least-cost reservoirs first, leaving the more “difficult” oil behind. Today, as much as half of the world’s original endowment of oil has been exploited, leaving a remainder that is more costly to produce. Many of these fields are found in inaccessible locations such as deep-water regions. In addition to the inaccessibility of new production, labor and equipment are also in short supply.

**Transportation Fuel Forecasts**

Forecasts of supply, demand, and prices for oil and gasoline are developed in the United States by the Department of Energy-Energy Information Administration (EIA) and in the international community by the International Energy Agency (IEA). Gasoline and diesel prices are dependent on oil market conditions and adequate refining and distribution capacity. Gasoline prices, in turn, impact regional fuel demand, travel behavior, and demand for transportation infrastructure. Inaccurate assumptions about gasoline prices could lead to poor transportation investment decisions and suboptimal mobility for the region’s residents and businesses. The following section presents both medium-term and long-term oil market forecasts.

**Medium-Term Forecast**

The IEA forecasts oil supply and demand to 2012 in its Medium-Term Oil Market Report (MTOMR). The 2007 MTOMR forecasts a “supply crunch” in the medium-term. The report foresees “increasing market tightness beyond 2010, with OPEC spare capacity declining to minimal levels by 2012.” The IEA projects that demand will reach 95.82 mmbd in 2012, a ten percent increase from 2007 and an average annual increase of 2.2 percent.

While the IEA does not offer price forecasts in the document, general conclusions can be drawn from its forecast of supply and demand. Depending on the degree to which current prices are being driven by financial speculation, they may recede from record-high levels. However, due to ongoing concerns about supply growth and a decline in spare capacity, the risk premium attached to oil prices will remain significant, and it is unlikely that prices will return to “pre-spike” levels in the medium-term.
Long-Term Supply Scenarios

The question of when oil supply will begin to permanently decline, known as peak oil, is one of tremendous importance, partly due to its impact on mitigation planning strategies of the kind contained in the RES. The following passages offer two possible scenarios for oil production and price to 2030. These scenarios will identify areas of uncertainty and provide a foundation upon which transportation fuel policies and assumptions may be based.

A. CONTINUED GROWTH WITH PLATEAU IN GLOBAL OIL PRODUCTION AFTER 2030

In its International Energy Outlook (IEO), the EIA projects that the supply of liquid fuels will continue to increase unabated to 2030. This perspective is shared by ExxonMobil and other major American oil companies, and by well-known energy consultants Cambridge Energy Research Associates (CERA). The EIA projects that production will reach 118 mmbd in 2030, keeping pace with global demand through the period. CERA forecasts supply growth to 130 mmbd by 2030.

Under this scenario, more than two-thirds of new production will come from OPEC nations, particularly Saudi Arabia. While production of conventional oil may struggle during the period, market signals will encourage new production of both conventional and unconventional oil that will replace any declines and further grow production by as much as 50 percent by 2030. Opportunities include ultra-deepwater fields, the Albertan tar sands and Venezuelan ultra-heavy oil, oil shale in the American West, and new discoveries that may be made in the Arctic region, parts of which have never been explored. Previously inaccessible reserves from aging fields will be added as horizontal drilling and other enhanced oil recovery techniques continue to be applied. In addition to tar sands and oil shale, liquefied coal and gas will be added into the transportation fuel mix.

In its 2007 Annual Energy Outlook, the EIA offers a forecast for 2030 real oil prices of $59 per barrel. The EIA does not publish long-term gasoline price forecasts. However, if the historical relationship between crude oil and gasoline prices is any indication, gasoline prices in 2030 would be considerably lower than current-day under this scenario. The last time oil cost $59 per barrel, in February 2007, California regular unleaded gasoline was priced at approximately $2.50 per gallon.

B. PEAK AND DECLINE IN GLOBAL OIL PRODUCTION BEFORE 2030

Under this scenario, petroleum cannot be extracted at a sufficient rate to continue increasing production and meeting global demand. This perspective is held by a number of petroleum geologists, scholars, energy investors, and oil companies. Experience has shown that production rates in every oil field reach a peak and then enter into an irreversible decline, even while around half of the original oil remains in the ground. Just as individual fields eventually peak and begin to decline, so do groups of fields and oil-producing regions and nations.

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1 The IEO definition of liquids refers to all conventional crude oil and energy liquid substitutes (such as ethanol, coal-to-liquids, and gas-to-liquids).
Production of conventional crude oil has peaked and is declining in the United States, Mexico, Canada, and Ecuador, all significant sources of oil for California. England, Norway, and Denmark—representing North Sea production—also are past their peak, along with other significant producers such as Malaysia, Indonesia, and potentially Russia, which currently is the world’s largest oil producer. A general consensus has developed in the oil industry and policy communities that non-OPEC production has peaked or will do so by 2010, despite having an estimated 176 billion barrels of proved reserves remaining in 2006. Global oil production, as a whole, is subject to same pattern of peak and decline, the key difference being that when global production peaks, oil from other regions will not be available to fill the shortfall.

In this scenario, global oil supply will peak and begin to decline between now and 2030, with most forecasts projecting a peak before 2016. The permanent decline of oil supply will restrict access to reliable, affordable transportation fuels and many related goods. Unconventional oil and other alternative fuels may be incapable of scaling up to replace declining conventional oil in a timely manner or to a degree that overall fuel production rates can continue to increase. Most unconventional fuels are expensive and difficult to produce, and present much lower “net energy” value than conventional oil, meaning that more energy must be invested to obtain energy. In addition, many unconventional fossil fuels, such as ultra-heavy oil, tar sands, oil shale, and liquefied coal, emit higher quantities of GHGs than conventional oil during their life cycle.

Prices in this scenario would be highly volatile and would rise to whatever level necessary to depress global demand in concert with declining global supply. The price elasticity of demand remains a key uncertainty, but what is known is that global demand has continued to increase in the current record-high price environment. Prices would need to increase to impact demand and would need to maintain a steady rate of demand destruction every year to keep pace with declining supply. The market also would encounter intermittent shortages, in which willing customers cannot gain access to fuel supplies at any price.

**Alternative Fuels Forecasts**

A combination of alternative fuels will provide an increasing share of the region's transportation fuels looking forward, due in part to ongoing increases in gasoline prices and regulatory mandates for cleaner fuels. However, uncertainties in the alternative fuels sector make it impossible to accurately forecast which specific fuels will gain favor and the degree to which they will replace petroleum-based fuels in a given time frame. Much will depend on technological advances that enable a specific fuel to scale up rapidly and affordably; such advances might include low-cost, high-energy density batteries for electric vehicles, or low-cost enzymatic processes to convert woody plants into ethanol. It should be noted that alternative fuels currently account for approximately one percent of transportation fuel consumed in the region, and no type of alternative fuel is poised for rapid adoption in the near-term.
In the absence of reliable forecasts, it is instructive to refer to state goals for alternative fuels use, which have been formulated by the CEC to be ambitious but plausible. The State Alternative Fuels Plan establishes a goal to increase the share of alternative fuels to 26 percent by 2022, and asserts that if that goal is attained, 30 percent alternative fuels share by 2030 would also be attainable.
June 26, 2008

AGENDA ITEM NO.: 7

Action Requested: DISCUSSION

DRAFT CLIMATE ACTION PLAN: SECTION 1

Attached are draft chapters of the SANDAG Climate Action Plan. Section 1 provides background on climate science and policy and lays out emissions forecasts and reduction scenarios for the transportation sector. EWG members are requested to provide comments and/or revisions.

Development of a Regional Climate Action Framework is a deliverable of the SANDAG energy planning program to the California Energy Commission (CEC). The draft will be submitted to the CEC on June 30, 2008.

Attachment 1: Draft Climate Action Plan: Section 1

Key Staff Contact: Brian Holland, 619-699-6915; bho@sandag.org
REGIONAL CLIMATE ACTION PLAN:
TRANSPORTATION
GREENHOUSE GAS ANALYSIS

DRAFT

June 30, 2008
The 18 cities and county government are SANDAG serving as the forum for regional decision-making. SANDAG builds consensus, plans, engineers, and builds public transit; makes strategic plans; obtains and allocates resources; and provides information on a broad range of topics pertinent to the region’s quality of life.

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ABSTRACT

TITLE: Regional Climate Action Plan: Transportation Greenhouse Gas Analysis Draft

AUTHOR: San Diego Association of Governments

DATE: June 30, 2008

SOURCE OF COPIES: San Diego Association of Governments
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Chapter 1 Introduction
1. INTRODUCTION: THE SCIENCE AND POLICY CONTEXT OF REGIONAL CLIMATE CHANGE PLANNING

Regional climate change planning is a relatively new and unexplored practice that regional agencies across the State of California are seeking to better understand. The SANDAG Regional Climate Action Plan (RCAP) is designed not only to comply with existing law but also to prepare the agency for a new paradigm in planning that is emerging from the state level. The Governor and Legislature of California have recognized that climate change poses a serious threat to the economic well-being, public health, natural resources, and environment of the state. Climate change legislation was signed by the Governor in 2006, and mitigation strategies that will affect local and regional entities are being established by state regulatory agencies. State climate change goals are ambitious and will require good faith efforts and evolution in every major sector of the economy if they are to be achieved.

It is widely recognized that regional planning agencies can, and likely will, play an important role in reducing greenhouse gas (GHG) emissions. In this context, the RCAP evaluates GHG emissions in the San Diego region and presents strategies for mitigating the region’s climate change impact. This chapter describes the science of climate change, the policy basis for climate change planning, and the function and format of the RCAP.

THE STATE OF THE SCIENCE

Knowledge about climate change (also known as global warming) and its causes has advanced significantly in recent years. While many of the conclusions are similar to those in past years, the scientific community has been able to attach a greater degree of certainty to those conclusions. In 2007, a major scientific report was released by the Intergovernmental Panel on Climate Change (IPCC), an international group that was established under the auspices of the United Nations to provide decision makers with objective information on climate change. The Fourth Assessment Report (AR4) expressed the consensus of its 1,250 academic authors that:

- Climate change is occurring,
- It is caused largely by human activities, and
- Urgent action is needed to mitigate its worst effects.

The basic physical science of climate change is undisputed. In the greenhouse effect—the fundamental process driving climate change—GHG such as carbon dioxide (CO₂), methane, and nitrous oxide (N₂O) block solar radiation that is reflected off the earth from exiting the earth’s atmosphere. That heat is trapped in the atmosphere, leading to a warming global climate. Some GHGs are naturally occurring, and they are critical to keeping the planet warm enough to be inhabited. Other GHGs that are anthropogenic or “man made” have been increasing significantly since the industrial revolution of the mid 1800s.
Climate Change Observations

In the past 150 years, the concentration of GHGs in the atmosphere has risen rapidly to levels unprecedented in the past 650,000 years. Concentrations of CO₂ have increased from pre-industrial levels of 280 parts per million (ppm) to approximately 384 ppm today. According to the IPCC AR4, the primary source of GHGs since the pre-industrial period has been human use of fossil fuels, with smaller secondary contributions from human-induced land use changes such as deforestation and agricultural cultivation. Figure 1.1 illustrates observed trends in atmospheric concentrations of GHGs.

![Figure 1.1 - Changes in the Atmospheric Concentration of Carbon Dioxide in the Past 10,000 Years](image)

Increases in GHG emissions have led to increases in global temperature and associated physical impacts such as snow and ice melt and sea level rise. Since 1850, temperature has risen approximately 1.37°F (0.76°C), and warming rates are increasing rapidly. In response, sea level rose approximately 7 inches (0.17 meters) in the 20th century, due to both thermal expansion and ice melt. Mountain glaciers and snow cover have declined in both hemispheres, and the Greenland and Antarctic Ice Sheets have both experienced net ice mass loss. Figure 1.2 describes changes in temperature, sea level, and snow cover.

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1 Increases in GHG emissions have led to increases in global temperature and associated physical impacts such as snow and ice melt and sea level rise. Since 1850, temperature has risen approximately 1.37°F (0.76°C), and warming rates are increasing rapidly. In response, sea level rose approximately 7 inches (0.17 meters) in the 20th century, due to both thermal expansion and ice melt. Mountain glaciers and snow cover have declined in both hemispheres, and the Greenland and Antarctic Ice Sheets have both experienced net ice mass loss. Figure 1.2 describes changes in temperature, sea level, and snow cover.

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1 Figures 1.1, 1.2, and 1.3 from Intergovernmental Panel on Climate Change (IPCC), Fourth Assessment Report—Climate Change 2007: The Physical Science Basis, 2007, reprinted with permission of the IPCC.
Climate Change Projections

A series of global GHG emissions scenarios were developed by the IPCC in its 2000 Special Report on Emissions Scenarios (SRES). The SRES were based on varying assumptions about economic growth, population growth, globalization, and technological progress, resulting in different emissions projections to 2100. The scenarios were modeled in the 2007 AR4 report to determine likely temperature ranges for each emissions scenario. Figure 1.3 illustrates the temperature ranges associated with GHG emissions scenarios.
Figure 1.3 - Scenarios for GHG Emissions from 2000 to 2100 and Projections of Surface Temperatures

Left Panel: Global GHG emissions in the absence of climate policies: six illustrative SRES scenarios (colored lines) and the 80th percentile range of recent scenarios published since SRES (gray shaded area). Dashed lines show the full range of post-SRES scenarios. Right Panel: Solid lines are global averages of surface warming for various emissions scenarios. The bars at the right of the figure indicate the best estimate (solid line within each bar) and the likely range assessed for the scenarios at 2090-2099. All temperatures are relative to the period 1980-1999.

Potential Impacts in California

In 2001, the California Climate Change Center published a report entitled Our Changing Climate, which outlined the climate change impacts that could be anticipated in California. The projections were based on low, medium, and high emissions rates from the IPCC SRES described above. Table 1.1 illustrates likely impacts to California from these three climate change scenarios.
### Table 1.1 - “Business-as-usual” Scenarios of Projected Global Warming Impact, 2070-2099

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<tr>
<td>Drought</td>
<td>1.5x more critically-dry years</td>
<td>2-2.5x more critically-dry years</td>
<td>2.5x more critically-dry years</td>
</tr>
<tr>
<td>Large Wildfires</td>
<td>10-35% increased risk</td>
<td>55% increased risk</td>
<td>---</td>
</tr>
</tbody>
</table>

### Dangerous Climate Change

Policies to reduce GHG emissions are generally aimed at avoiding “dangerous anthropogenic interference”—the most dangerous or catastrophic impacts of climate change. At higher emissions levels and temperatures, the scientific community warns of such effects as:

- Climate system tipping points, when impacts like ice sheet melt contribute to additional warming, resulting in runaway climate change
- Ice sheet melt with sea level rise and inundation of coastal settlements
- Mass species extinction
- Collapse of part or all of the Amazon rainforest
- Weakening of the “ocean conveyor belt” that influences European climate

Scientific literature generally places the likely onset temperature of dangerous climate change effects at around 3.6°F (2°C) above pre-industrial levels, which by most accounts correlates GHG concentrations between 350 and 450 ppm. Current atmospheric CO₂ concentration is within this range at 384 ppm, and concentrations are rising at approximately 2 ppm per year.

### POLICY RESPONSES TO CLIMATE CHANGE

#### International and Federal Policy

Efforts to address climate change through policy measures began in 1988 when the United Nations Environmental Program (UNEP) in conjunction with the World Meteorological Organization (WMO) established the IPCC. The group published its first assessment report in 1990 that analyzed the scientific data then available on climate change, assessed environmental and socio-economic impacts, and formulated realistic responses to climate change.
At the 1992 United Nations Conference on the Environment and Development (UNCED) in Rio de Janeiro, the United States joined 153 countries in signing the Framework Convention on Climate Change, an international agreement to address the danger of global climate change. The Framework was a non-binding agreement in which the United States and other nations pledged to reduce emissions of all GHG to 1990 levels by the year 2000 and to assist developing nations in limiting their GHG emissions. The Framework was entered into force in 1994 and became international law for all the parties that ratified it. The United States response to the 1992 Framework was the establishment of a Climate Change Action Plan by President Bill Clinton.

The next major international climate agreement came with the negotiation of the Kyoto Protocol in Kyoto, Japan in December 1997. The agreement called on industrialized countries to reduce their collective emissions to 5.2 percent below 1990 levels by 2012. Of all industrialized nations, the U.S. alone has declined to ratify the Protocol, citing concerns with the agreement’s impact on economic growth. Despite the lack of movement on the issue at the federal level over the past eleven years, state and local governments in the United States have gone forward with climate change mitigation activities.

Local and State Policy

Hundreds of cities around the nation have signed the United States Mayors Agreement on Climate Protection, which commits signatories to GHG reductions on the scale of the Kyoto Protocol. Some of these cities have developed Climate Action Plans that catalogue local GHG emissions and establish reduction strategies, but few of the signatories are on track to reach their goals. While important action and leadership has been demonstrated at the local level, every level of government will need to engage in climate change policymaking to have a meaningful effect on emissions.

The State of California has emerged as a leader in addressing climate change in the United States. The state has set goals for GHG emissions reduction and is engaged in regulatory activities to cut emissions from the largest-emitting sectors of the economy. The following section describes some of the state climate change policies and initiatives most relevant to regional climate change planning.

Executive Order S-3-05

In 2005, Governor Schwarzenegger issued Executive Order S-3-05, which established statewide GHG emissions reduction targets:

- By 2010, reduce GHG emissions to 2000 levels
- By 2020, reduce GHG emissions to 1990 levels
- By 2050, reduce GHG emissions to 80 percent below 1990 levels
Executive Order S-3-05 directed the California Environmental Protection Agency to form a Climate Action Team composed of representatives from relevant state agencies, including the Business, Transportation, and Housing Agency, the Department of Food and Agriculture, the Resources Agency, the Air Resources Board, the Energy Commission, and the Public Utilities Commission. The Climate Action Team was tasked with implementing GHG emission reduction programs and reporting on the progress made toward meeting statewide GHG targets established in the executive order.

Assembly Bill 32—The California Global Warming Solutions Act of 2006

GHG emission reduction targets were established in Assembly Bill (AB) 32 (Nunez), the California Global Warming Solutions Act of 2006. AB 32 was signed into law in September 2006, establishing statewide GHG emissions targets that will reduce emissions to 1990 levels by 2020—a reduction of approximately 25 percent below current levels. AB 32 directs the California Air Resources Board (CARB) to monitor and regulate GHG emissions in pursuit of this goal, in coordination with all relevant state agencies.

AB 32 directs CARB to monitor and regulate GHG emissions in order to reach the legislation’s GHG reduction target. The bill mandates the following approach:

- By June 30, 2007, CARB would develop a list of early action measures that can be implemented by January 1, 2010.
- By January 1, 2009, CARB will prepare and approve a scoping plan for achieving the maximum technologically feasible and cost-effective reductions in GHG emissions by 2020.
- By January 1, 2011, CARB will adopt regulations to achieve the maximum technologically feasible and cost-effective reductions in GHG emissions in furtherance of achieving the statewide GHG emissions limit, to become operative beginning on January 1, 2012.

The list of early action measures has been published. While none of the initial measures fall directly under SANDAG jurisdiction, some are related to SANDAG transportation and energy activities, including port electrification, trucking efficiency, and the Low-Carbon Fuel Standard. The January 2009 Scoping Plan will contain the primary strategies California will employ to reduce GHG emissions. The plan is expected to include strategies for regulating emissions resulting from land use and transportation plans. A draft of the plan is scheduled for release in June 2008. In 2011 and 2012, regulations may include emission reduction mandates, alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, and market-based mechanisms such as a cap-and-trade system.
California Transportation Commission—Regional Transportation Plan Guidelines Update

In January 2007, Senate Pro Tempore Don Perata requested that the California Transportation Commission (CTC) review its Regional Transportation Plan (RTP) Guidelines to incorporate climate change emission reduction measures and utilize models that accurately measure the benefits of land use strategies aimed at reducing vehicle trips. The CTC established a RTP Guidelines Work Group to assist in developing recommendations for the guidelines. SANDAG staff participated in the working group meetings, which were divided into three subsections: Climate Change, Smart Growth/Land Use, and Transportation Modeling and Analysis.

The Work Group recommendations were provided to the CTC and Senate Pro Tempore Perata in December 2007. On January 10, 2008 the CTC recommended that the results of the RTP Guidelines Work Group be included in an addendum to the RTP Guidelines. Although none of the information contained within the addendum is identified in current state statute and therefore not required by State (or federal) law, MPOs and RTPAs are strongly encouraged to adhere to the guidance. The RTP Work Group’s recommendations will be provided to Caltrans for incorporation into the currently approved RTP Guidelines. The CTC will continue to review the RTP Guidelines as new statutory requirements are enacted and polices regarding climate change emission reductions are adopted.

California Office of Planning and Research—California Environmental Quality Act (CEQA) Guidelines Update

CEQA requires that “cumulatively considerable” impacts be analyzed in environmental documents. Appendix G of the CEQA Guidelines, published by the Office of Planning and Research (OPR), provides guidance on how to evaluate these impacts. Currently, the CEQA Guidelines do not provide direction on evaluating climate change impacts, resulting in significant uncertainty on the part of lead agencies in preparing their CEQA documents.

Senate Bill (SB) 97 (Dutton), which was signed into law by the Governor on August 24, 2007, addresses the current lack of guidance concerning addressing climate change under CEQA. SB 97 directs OPR to draft CEQA guidelines for analyzing climate change impacts and to submit them to the State Resources Agency for adoption by January 1, 2010. These guidelines will be utilized by SANDAG in drafting its future CEQA documents when they become available.

Attorney General CEQA Actions

Since the passage of AB 32, the State Office of the Attorney General (AG) has monitored and commented on the climate change component of both programmatic and project-level environmental impact reports (EIRs), including that of the SANDAG 2030 Regional Transportation Plan: Pathways for the Future (2030 RTP), adopted in November 2007. The AG holds that climate change is a cumulatively considerable impact that must be analyzed and mitigated in CEQA documents. Though CEQA Guidelines do not provide a methodology for assessing climate change impacts, the AG has provided guidance on this subject through comment letters on an ad hoc basis. More than 20 comment letters have been delivered to lead agencies across the state,
recommend an approach to environmental analysis that includes GHG inventories and low significance thresholds. The AG has also provided a detailed fact sheet with climate change mitigation best practices.

In addition to the comment letters, the AG brought a lawsuit against San Bernardino County for inadequately addressing climate change impacts in its General Plan EIR; a settlement was reached in August 2007 that requires the County to develop a GHG Reduction Plan.

THE JURISDICTIONAL FRAMEWORK OF CALIFORNIA CLIMATE POLICY

The content of the RCAP and regional climate change planning is influenced by policymaking responsibilities at the state and local levels. Jurisdiction over GHG emitting-activities and sectors is distributed among various levels of government and among agencies, and the RCAP is based on an understanding of the appropriate role of regional agencies within the organizational framework of California policymaking.

As the agency responsible for implementing AB 32, CARB is the primary entity developing climate change policy at the state level. CARB is authoring the Scoping Plan, which will lay out high-level strategy and policy for climate change mitigation across the economy, including the transportation, electricity generation, natural gas, and industrial sectors. In addition, an inter-agency Climate Action Team was formed under Executive Order S-3-05 to develop policy in pursuit of that order’s GHG reduction goal. The Climate Action Team is led by the California Environmental Protection Agency (CalEPA) and includes such agencies as the California Energy Commission (CEC), the California Public Utilities Commission (CPUC), and the Department of Water Resources. The Team makes recommendations to CARB on Scoping Plan developments. Figure 1.4 illustrates the framework of climate change planning and policymaking.

The Role of SANDAG

SANDAG serves as the Metropolitan Planning Organization, Regional Transportation Planning Agency, and Regional Consolidated Agency (pursuant to SB 1703) for the San Diego region, under which authority it is responsible for regional transportation planning and federal and state revenue allocation, as well as public transit planning, programming, project development, and construction. In addition, SANDAG has adopted a Regional Comprehensive Plan (RCP) (pursuant to AB 361) under which it provides policy guidance and coordination in other areas such as land use, environmental resource planning, regional infrastructure planning, and interregional and binational planning.

In surveying the landscape of climate change policymaking, SANDAG staff has determined that it is best suited to address mitigation policy for the transportation, electricity, and natural gas sectors, based on its jurisdiction and expertise. Other sectors—such as the industrial, agricultural, and aviation sectors—are better addressed at the state level by CARB and other state agencies. The following section describes how SANDAG involvement in regional comprehensive planning complements planning needs to address climate change.
On-Road Transportation Emissions

SANDAG has jurisdiction over transportation planning, land use policy coordination, and transportation demand management help to reduce GHG emissions in the on-road transportation sector.

Transportation and Transit Planning. In its regional transportation and transit planning role, SANDAG can have an impact GHG emissions from on-road transportation. GHG emissions from transportation are influenced by the following three primary factors:

- Fuel Carbon Intensity (measured in grams CO₂ per unit of energy)
- Vehicle Technology and Fuel Efficiency (measured in miles per gallon)
- Travel Demand (measured in trips and vehicle miles traveled)

Phrased another way, emissions can be reduced by using cleaner fuels, using less fuel per mile traveled, or traveling fewer vehicle miles. Fuel and vehicle standards are established at the state and federal levels, and SANDAG cannot develop standards for, or be accountable for, emissions related to these factors. Travel demand, however, is greatly influenced by transportation infrastructure investments identified in regional and local transportation and transit plans.
Although travel demand-related GHG targets have not yet been established by the state under AB 32, evaluation and mitigation measures for GHG emissions were included in SANDAG’s RTP EIR, adopted in November 2007. As described above, the AG has taken the position that climate change impacts must be evaluated in CEQA documents. SANDAG communicated with the AG while preparing its RTP EIR to ensure that it complied with the AG’s interpretation of CEQA in this regard. On April 30, 2008, SANDAG also entered into a settlement agreement with parties that had filed a CEQA claim against SANDAG alleging insufficiencies in the RTP EIR treatment of climate change impacts. Under this settlement agreement, SANDAG agreed to engage in a number of transportation and transit planning analyses with the objective of further addressing GHG emissions.

**Blueprint Planning.** In addition to traditional transportation planning, SANDAG manages a “Blueprint Planning” process that addresses the correlation between transportation and land use planning and the relationship between local and regional plans. While land use planning authority is held exclusively by local jurisdictions, SANDAG has engaged those member agencies in generating a consensus-based vision for smart growth land use in the region, documented in a RCP. Land use planning affects travel demand by permitting development types that either can or can not be served economically by alternative modes of transportation such as walking, bicycling, and transit. The RCP establishes a regional land use vision that includes voluntary, incentive-based smart growth policies and programs that when implemented by local jurisdictions have been shown to reduce vehicle trips and vehicle miles traveled (VMT). This regional planning process serves as a useful forum for voluntary coordination of land use and transportation planning around smart growth principles at a regional level.

**Transportation Demand Management.** As part of a comprehensive approach to regional transportation planning, SANDAG manages Transportation Demand Management (TDM) programs, including carpool and vanpool matching services, a “guaranteed ride home” program, and employer education on alternative work schedules and teleworking. These types of programs can further reduce single-occupancy vehicle trips and associated GHG emissions.

**Electricity and Natural Gas Emissions**

While SANDAG holds no regulatory authority over energy utilities, the agency has a long history of energy planning dating back to the 1970s. In 2003, SANDAG adopted a Regional Energy Strategy that identified goals, policies, and implementation strategies for improving the energy performance of the region. These activities build consensus around regional energy goals, and as such have an impact on GHG emissions from the electricity and natural gas sectors.

While SANDAG can play a part in developing emission goals and mitigation strategies for the electricity and natural gas sectors, especially as they relate to transportation fuels and the built environment, the agency does not hold any regulatory authority over the sectors. As the region’s Investor Owned Utility (IOU) and the primary provider of electricity and natural gas services, San Diego Gas and Electric (SDG&E) develops a Long-Term Resource Plan that identifies the mix of resources that will be procured over the coming ten years. Decisions about whether to procure electricity from natural gas-fired generating facilities or from renewable resources are based on this plan. SDG&E resource planning is regulated by the CPUC.
With regards to energy efficiency measures, SANDAG member agencies are in a position to reduce emissions through their regulation of land use and building construction. Local jurisdictions can adopt land use plans that shape a more energy-efficient urban form. Local jurisdictions can also strengthen building standards for energy efficiency. Through its regional energy planning role, SANDAG is able to serve as a resource for local jurisdictions that seek to improve energy efficiency in their communities through land use planning and building standards.

**REGIONAL CLIMATE ACTION PLAN**

The SANDAG RCAP is a long-range plan for reducing regional GHG emissions from the transportation, electricity, and natural gas sectors. The RCAP evaluates current and projected emissions to 2030 and identifies goals, policies, and implementation strategies for reducing emissions to targeted levels by 2030. The planning process follows the steps outlined below:

- **Regional GHG Inventory.** The Inventory catalogues all regional GHG emissions from 1990 to 2006.
- **Business-as-usual (BAU) Forecasts.** BAU Forecasts illustrate the emissions that can be expected from existing plans and policies in 2030 in the three sectors under consideration.
- **GHG Test Targets.** “Test targets” for 2030 GHG emissions are identified for each of the three sectors. These targets are based on state goals, but have not been adopted by state agencies. Chapter 2 describes the targets in greater detail.
- **GHG Reduction Scenarios.** For each sector, a scenario consisting of multiple mitigation strategies is analyzed for its impact on GHG emissions. The goal of the scenario building is to evaluate the feasibility of reaching the test targets through a combination of ambitious but plausible measures.
- **Policy Development.** Based on the information gathered in testing the targets and scenarios described above, the final phase of the planning process is to develop and recommend goals, policies, and implementation strategies.

This draft of the Climate Action Plan includes the GHG Inventory, BAU Forecast, Test Target, and GHG Reduction Scenarios for the transportation sector only. It is intended to provide SANDAG staff, CEC staff, stakeholders, and decision-makers with the results of staff analysis of transportation-related GHG emissions and potential mitigation strategies. It does not include GHG analysis for the electricity and natural gas sectors. Further, it does not include policy recommendations for any sector. The document is an interim step in the planning process, intended only as a resource to inform and advance policy development for the RCAP.

The next draft document under the RCAP process, scheduled for completion by September 30, 2008, will provide GHG analysis for the electricity and natural gas sectors. A full draft of the RCAP is scheduled for completion in December 2008, and the final plan will be available for consideration in the second quarter of calendar year 2009.
Chapter 2 Regional Greenhouse Gas Inventory, Forecasts, and Targets
2. REGIONAL GREENHOUSE GAS INVENTORY, FORECASTS, AND TARGETS

The Regional Climate Action Plan (RCAP) is grounded in quantitative analysis of greenhouse gas (GHG) emissions. The analysis includes historical, current, and forecasted emissions in the region, and preliminary 2030 GHG targets are put forth based on these emissions data. This chapter describes the GHG inventory, forecasts, and targets that inform RCAP policy development.

SAN DIEGO REGIONAL GHG INVENTORY—CURRENT AND 1990 EMISSIONS

The regional GHG inventory provides a detailed picture of emissions across the regional economy from 1990 to 2006. The RCAP uses 2006 as its “current” year and 1990 as its “baseline” year upon which GHG targets are based.

Almost half of current GHG emissions in the San Diego region can be attributed to on-road transportation activities. Electricity is the next highest-contributing sector, followed by natural gas. These three sectors together account for approximately 83 percent of total GHG emissions in the region. Compared to the statewide emissions distribution, notable differences stand out in the regional data. Transportation comprises a much higher share of emissions than it does statewide, while the industrial and agriculture sectors are much less of a factor regionally. Electricity emissions are similar between the region and the state, consisting of approximately one-quarter of total emissions.

Regional emissions grew by 18 percent between 1990 and 2006, slower than the regional population growth rate of 24 percent. This trend of per capita emissions reduction is attributable to declining emissions from the industrial sector and flat emissions growth from natural gas. In comparison, statewide emissions grew approximately 12 percent between 1990 and 2004.

Figure 2.1 illustrates the current distribution of regional emissions by sector, highlighting the three sectors addressed in the RCAP. Figure 2.2 displays statewide emissions by sector in 2004.

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2 The regional GHG inventory is under development at the University of San Diego School of Law, Energy Policy Initiatives Center, in association with SANDAG and the San Diego Foundation. Transportation data generated separately by SANDAG. Data presented in this section are preliminary and should not be quoted. Final inventory data is scheduled to be available in September 2008 and will be included in the next draft of the RCAP.
Figure 2.1 - San Diego Region GHG Emissions by Sector in 2006
(Million tons CO₂ equivalent, mmtCO₂e)

Electric Generation 26%
Residential 6%
Commercial 3%
Industrial 20%
Agriculture 6%
Transportation 49%

Other Transportation (Rail, Water, Air) 6%
Waste 2%
Industrial Natural Gas and Other 5%
Commercial Natural Gas 3%
Residential Natural Gas 5%

Electricity 26%
Off-road Transportation and Equipment 4%

Figure 2.2 - Statewide GHG Emissions by Sector in 2004
(Million tons CO₂ equivalent, mmtCO₂e)

Transportation 39%
Electric Generation 26%
Residential 6%
Commercial 3%
Agriculture 6%
Industrial 20%
**On-road Transportation Sector Inventory**

The on-road transportation sector encompasses passenger cars, light-duty trucks, medium-duty trucks, heavy-duty trucks (including diesel trucks), transit buses, and motorcycles. For the purposes of this analysis, CO₂ is used as a proxy for all GHG emissions, since CH₄ and N₂O emissions are negligible in transportation activities.

This sector currently emits 17.593 million tons CO₂ (mmtCO₂) annually, a 41 percent increase from 1990 emissions levels of 12.511 mmtCO₂.

**Electricity and Natural Gas Sectors Inventory**

Analysis of historical and current GHG emissions from the electricity and natural gas sectors is ongoing. This data will be presented in the September 30, 2008, draft of the RCAP.

**2030 BUSINESS-AS-USUAL FORECASTS**

In addition to evaluating historical and current emissions, the RCAP includes emission projections to 2030 for the three major sectors the plan addresses. These forecasts are based on existing plans and policies, or “business-as-usual.” Understanding these trends is important for determining the scale of effort required to bridge the gap between long-range GHG projections and GHG goals.

**On-road Transportation Sector Forecast**

Annual GHG emissions from the on-road transportation sector are projected to grow to 22.535 mtCO₂ in 2030, an increase of 28 percent above current levels. This rate is slightly less than the growth rates in VMT and population over the same period. This GHG emissions projection is based on the SANDAG RTP 2030 and existing local land use plans.³

**Electricity and Natural Gas Forecasts**

Forecasts for the electricity and natural gas sectors are currently under development, and will be included in the September 30, 2008 draft of the RCAP.

**2030 GREENHOUSE GAS TEST TARGETS**

Preliminary GHG reduction targets for each of the three sectors also are included in this phase of the RCAP process. These preliminary goals are referred to as “test targets” to emphasize that they are not recommended targets, and may not be feasible or desirable goals upon which to ultimately

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³ Fuel efficiency and fuel carbon intensity are assumed to remain at current levels, and state vehicle and fuel standards currently under development are included in the GHG reduction scenario in Chapter 3.
base specific RCAP policies. Instead, they represent a starting point to guide initial analysis of GHG reduction scenarios. These scenarios provide a better understanding of the challenge of reducing emissions to desired levels, and the iterative RCAP process allows for a re-evaluation of the target in light of the scenario results.

**How the Test Targets were Developed**

One primary objective of the RCAP is to help the region play its part in meeting state climate change goals. The regional, sector-specific test targets for 2030 are based on state goals for statewide, economy-wide GHG reductions for 2020 (established in AB 32) and 2050 (established in Executive Order S-3-05). The state does not have a 2030 GHG goal, and state agencies have not allocated emissions reductions goals to the region or sector level. To account for this incongruity in time horizon, geographic scale, and sector detail, a number of assumptions are made in developing test targets to ensure that the RCAP is in keeping with the spirit of state climate change goals:

- First, it is assumed that progress between the 2020 and 2050 goals will be linear, and that a 2030 target could be placed along that line. The state’s goals are to reduce emissions to 1990 levels by 2020 and to 80 percent below 1990 levels by 2050. A linear interpolation between these two points generates an emissions reduction goal of **27 percent below 1990 levels by 2030**. In reality, appropriate 2030 targets may be more or less depending on the path and pace of change.

- To account for geographic scale and sector detail, it is assumed that a specific sector in the San Diego region will be accountable for emission reductions proportional to its own 1990 baseline regional emissions. For example, the regional electricity sector target will be 27 percent below emissions from the regional electricity sector in 1990. This approach will not necessarily be followed by CARB in developing targets under AB 32. AB 32 requires statewide, economy-wide reductions, but does not specify that those reductions must come from individual regions and sectors proportionate to their 1990 baseline emissions levels.

These assumptions were necessary to develop a test target based on the best information available from the state. While they are useful in this regard, targets may be reevaluated pending the conclusions of the GHG reduction scenarios. It is SANDAG’s understanding that identifying GHG reduction targets that are not strictly proportional to sector-specific baseline levels is still in line with the intent of state goals such as AB 32, which stipulates that targets will be based on the cost-effectiveness of mitigation measures, regardless of sector.

**Transportation Test Target**

The preliminary 2030 target for the on-road transportation sector is 9.133 mmtCO₂, 27 percent below baseline 1990 emissions levels of 12.511 mmtCO₂. This target is 48 percent below current levels and 59 percent below projected 2030 levels.
Electricity and Natural Gas Targets

Targets for these sectors are currently under development and will be presented in the September 30, 2008, RCAP draft.
Chapter 3 Greenhouse Gas Reduction
Scenario: On-road Transportation
3. GREENHOUSE GAS REDUCTION SCENARIO: ON-ROAD TRANSPORTATION

Until recently, reducing greenhouse gas (GHG) emissions was not a primary goal of regional transportation planning. While the academic literature provides some insight into mitigating climate change through land use and transportation planning, real-world experience in doing so is somewhat limited. As a result, regional agencies do not have a sufficient knowledge base to begin setting emissions goals and policies at the start of the process. An important component of the Regional Climate Action Plan (RCAP) GHG analysis is a set of GHG reduction scenarios that help to build this knowledge base by testing various strategies for their impact on emissions. This chapter presents the results of the scenario generated for emissions reduction from the on-road transportation sector.

SCENARIO BUILDING APPROACH

The GHG reduction scenario is composed of a series of strategies that have been shown to reduce vehicle miles traveled (VMT) and associated GHG emissions. Other criteria for selecting strategies are that they are technically feasible (though not necessarily politically viable) and that implementation would fall under the jurisdiction of SANDAG and its member agencies. The scenario also evaluates the contribution of state regulations currently under development that are likely to take effect within the RCAP planning horizon.

The objective of the scenario is to identify the scope and scale of efforts necessary to reduce GHG emissions from projected 2030 business-as-usual (BAU) levels to 2030 test targets levels.

STRATEGIES AND PROJECTED OUTCOMES

Measures to reduce GHG emissions in the on-road transportation sector fall into three categories: fuel composition, fuel efficiency, and travel demand. These approaches were described in Chapter 1 as using cleaner fuels, using less fuel per vehicle mile traveled, and traveling fewer vehicle miles. All of these approaches will be required to meet the state’s climate change goals. The RCAP scenarios begin by measuring emissions reductions from strategies for which state government is responsible—in this case, fuel efficiency and fuel composition—and regional strategies are then evaluated in the context of state contributions.

State Vehicle Emissions Standards

Assembly Bill (AB) 1493 (Pavley) was signed into law in 2002, requiring the California Air Resources Board (CARB) to develop GHG emission standards for passenger vehicles. CARB adopted the standards, known as the Pavley rules, in September 2004. The standard is to come into effect with 2009 model vehicles and would become more stringent incrementally until the 2016 model year.
While the standards are intended to reduce carbon dioxide pollution (expressed in CO₂ grams per mile), automobile manufacturers will comply primarily through improvements in vehicle fuel efficiency (expressed in miles per gallon, or mpg). CARB estimates that the Pavley rules will result in an average passenger vehicle/light-duty truck fuel efficiency of 36.6 mpg in 2016, increasing to 43.9 mpg by 2020 under a possible extension of the standard.

Implementation of the Pavley rules currently is held up by the U.S. Environmental Protection Agency (EPA). Under the federal Clean Air Act of 1970, federal air quality regulations preempt those adopted by individual states, and the EPA is currently developing new federal fuel efficiency standards, called for in 2007 Energy Bill, that preempt state standards. However, Section 209 of the Clean Air Act also requires the EPA to waive its preemption of California regulations when the agency determines that California’s standard will be at least as protective of public health and welfare as the federal standard. This provision was intended to encourage California to continue demonstrating national leadership in regulating air pollution.

In December 2005, the State of California submitted an application for a waiver for the Pavley rules to the EPA. In December 2007, the EPA announced that it was denying the waiver request, effectively bringing AB 1493 implementation to a halt. The State of California and 15 other states appealed the decision to the 9th Court of Appeals in January 2008, and the outcome of that appeal remains uncertain.

Many observers, including EPA staff members involved in the agency’s evaluation of the waiver request, believe California’s request to be grounded on a solid legal basis. For RCAP planning purposes, it is assumed that California will obtain its waiver and that the Pavley rules will be implemented on schedule.

In the GHG reduction scenario, CARB’s estimate of a 43.9 mpg standard in 2020 is assumed to remain in place in 2030. The impact of the Pavley standards on regional GHG emissions is shown in Figure 3.1 below.

**State Alternative Fuels Standards**

The State of California has been engaged for many years in promoting alternatives to fossil fuel-based transportation fuels. These efforts are particularly important to climate change mitigation, as many alternatives can reduce GHG emissions below those of gasoline and diesel fuel. The California Energy Commission adopted a State Alternative Fuels Plan in November 2007 that establishes goals and actions for alternative fuels adoption, and a Low Carbon Fuel Standard will require transportation fuel emissions reductions in the coming years.

Development of a Low Carbon Fuel Standard (LCFS) was called for under Executive Order S-1-07 in January 2007. In June 2007, CARB identified the LCFS as a “discrete early action measure” under AB 32, requiring that the regulation come into effect no later than January 1, 2010. The standard requires fuel suppliers and distributors to reduce the carbon intensity of their fuels (GHG emissions per unit of energy) by 10 percent by 2020. The standard utilizes a lifecycle analysis (“well to wheels”) for determining carbon intensity. Lifecycle emissions include not only tailpipe emissions, but also those associated with the production, processing, and transportation of fuel.
In this RCAP scenario, the LCFS is used as a measure of the contribution of alternative fuels to regional climate change goals. The standard reduces fuel carbon intensity by 10 percent by 2020, and the scenario first assumes that this 10 percent reduction will remain constant until 2030. An extension of the LCFS is modeled as well, assuming a linear improvement in carbon intensity resulting in a 20 percent reduction below current levels in 2030. This assumed extension is within the realm of possibility from foreseeable advances in second generation biofuels, batteries, and California’s share of renewable electricity. The impact of state alternative fuels standards is shown in Figure 3.1 below.

It should be noted that the ten to 20 percent lifecycle emissions reduction from state low carbon fuel standards will not necessarily result in an equal reduction in tailpipe emissions, which are the focus of this chapter. The degree to which tailpipe emissions are reduced depends greatly on the mix of fuel types that are used to comply with the standard. For example, if battery-electric vehicles become the primary alternative, tailpipe emissions may be reduced by significantly more than 20 percent. On the other hand, if cellulosic ethanol were to emerge as the primary alternative, tailpipe emissions may be reduced less than 20 percent, despite a larger lifecycle reduction made possible by the uptake of CO₂ in the cultivation of fuel feedstock. How lifecycle analysis of alternative fuels will influence regional transportation emissions goals deserves careful consideration at the state level. For the purposes of the scenario, tailpipe emissions are assumed to be reduced by the same percentage as lifecycle emissions overall.

**IMPACT OF STATE VEHICLE AND FUEL STANDARDS**

In 2030, the Pavley standards will reduce regional GHG emissions from on-road transportation to approximately 16.9 million metric tons CO₂ (mmtCO₂), 25 percent below BAU levels. The LCFS would reduce emissions by another ten percent below the Pavley standard emissions level, and a possible extension of the LCFS would count for an additional 10 percent reduction. Taken as a whole, state vehicle and fuel standards would reduce emissions by 40 percent, or approximately 9 mmtCO₂, as illustrated in Figure 3.1. These standards contribute two-thirds of the emissions reduction needed to reach the test target, representing a new baseline from which travel demand measures will further reduce emissions.
Travel Demand Strategies

Travel demand is the third and final factor contributing to transportation emissions. As demonstrated above, foreseeable improvements in vehicle and fuel technology will not be sufficient in pursuing long-term GHG goals, and a shift away from single-occupancy vehicle travel will be a necessary and fundamental component of climate change policy. Regulatory authority over many strategies for reducing travel demand resides with local and regional agencies, in the San Diego region primarily SANDAG, transit agencies, and local jurisdictions.
This part of the scenario includes measures that can be affected by local and regional agencies. The measures were selected with an eye to providing diverse and attractive transportation options, and to pricing transportation-related activities in a manner that more accurately reflects their costs. The essential objective across all of these strategies is to reduce VMT and facilitate a shift to more energy-efficient modes of transportation, such as commuter rail, light rail, bus rapid transit, local bus, high-occupancy vehicles, and non-motorized modes such as walking and bicycling.

The following section describes the assumptions and projected outcomes associated with a Low Carbon Land Use Scenario, an Enhanced Transit Scenario, and Transportation Demand Management (TDM) strategies that modeled in the scenario. The strategies are modeled on a cumulative basis, such that the Low Carbon Land Use Scenario is first modeled alone, then the Enhanced Transit Scenario is modeled with the Low Carbon Land Use Scenario, and finally the TDM measures are modeled on the basis of the new land use and transit scenarios. Economic impacts and fiscal considerations are not evaluated in this draft of the RCAP, but will be addressed in the next draft document. Estimated GHG emissions reductions and other indicators are shown in Table 3.1. Taken as a whole, these three travel demand strategies reduce GHG emissions by approximately 16.5 percent, as illustrated in Figure 3.2.

### Table 3.1 - Transportation GHG Reduction Scenario—Projected Outcomes for GHG Emissions, VMT, and Mode Share

<table>
<thead>
<tr>
<th>Strategy</th>
<th>GHG Emissions Reduction (% below baseline*)</th>
<th>VMT Reduction (% below baseline)</th>
<th>Transit Share</th>
<th>Non-Motorized Mode Share</th>
<th>High-Occupancy Vehicle Share (by vehicle ridership)</th>
<th>Single-Occupancy Vehicle Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business-as-usual (2030 RTP)</td>
<td>n/a</td>
<td>n/a</td>
<td>2.1%</td>
<td>2.7%</td>
<td>44.1%</td>
<td>50.4%</td>
</tr>
<tr>
<td>Low Carbon Land Use</td>
<td>1.4%</td>
<td>1.3%</td>
<td>2.6%</td>
<td>2.8%</td>
<td>44.1%</td>
<td>49.8%</td>
</tr>
<tr>
<td>Add Enhanced Transit</td>
<td>2.4%</td>
<td>2.8%</td>
<td>2.7%</td>
<td>2.8%</td>
<td>43.9%</td>
<td>49.8%</td>
</tr>
<tr>
<td>Add TDM Measures</td>
<td>16.5%</td>
<td>16.3%</td>
<td>11.4%</td>
<td>13.0%</td>
<td>35.9%</td>
<td>40.0%</td>
</tr>
<tr>
<td>Telecommuting alone</td>
<td>4.3%</td>
<td>4.3%</td>
<td>2.6%</td>
<td>2.9%</td>
<td>44.5%</td>
<td>49.4%</td>
</tr>
<tr>
<td>Regional Carbon Fee alone</td>
<td>0.8%</td>
<td>0.8%</td>
<td>2.8%</td>
<td>2.8%</td>
<td>44.0%</td>
<td>49.7%</td>
</tr>
<tr>
<td>Pay-as-you-drive Insurance alone</td>
<td>1.0%</td>
<td>1.0%</td>
<td>3.2%</td>
<td>2.9%</td>
<td>43.7%</td>
<td>49.6%</td>
</tr>
<tr>
<td>Smart Growth Parking Fees alone</td>
<td>11.8%</td>
<td>11.3%</td>
<td>11.0%</td>
<td>12.8%</td>
<td>35.8%</td>
<td>39.8%</td>
</tr>
</tbody>
</table>

* Below the baseline established by the Pavley standard and Low Carbon Fuel Standard Extension.
The analysis demonstrates that regional and local agencies can make a difference in reducing transportation emissions. In addition, application of regional transportation models in this analysis, revealed potential deficiencies in modeling capabilities, particularly with regards to fully accounting for the travel demand effects of smart growth land use characteristics. These questions will be described in more detail below and will addressed in the next phase of the RCAP process, potentially making regional models more consistent with the true benefits of smart growth development patterns.

LOW CARBON LAND USE SCENARIO

Over the past decade, numerous studies have demonstrated that smart growth land use patterns reduce travel demand and GHG emissions. Smart growth development characteristics that influence travel behavior can be summarized by the following “5-Ds”:

- Density of development
- Diversity of land uses
- Design for improved walking and bicycling
- Destination (proximity to regional destinations)
- Distance to transit (transit-orientation)

By placing homes and workplaces closer to desirable destinations and transit routes, this land use planning approach shortens automobile trips and enables greater use of transit and non-motorized modes of transportation. While smart growth is being implemented at many sites around the region, it has not taken hold as the guiding principle of development in the region. The Low Carbon Land Use Scenario is not a recommendation, but an evaluation of the GHG emissions outcome of broad-based smart growth implementation across all local jurisdictions.

Assumptions

The Low Carbon Land Use Scenario is based on the “build-out” of the SANDAG Smart Growth Concept Map, which was first developed in 2006 and most recently updated in June 2008. The Concept Map illustrates the location of existing, planned, and potential smart growth “opportunity areas” in the region and is an important tool for implementing the Regional Comprehensive Plan goal of better coordinating land use and transportation. The Concept Map contains almost 200 locations in seven smart growth categories identified in the RCP. The seven smart growth “place types” include the Metropolitan Center, Urban Centers, Town Centers, Community Centers, Rural Villages, Mixed Use Transit Corridors, and Special Use Centers. One place type is assigned to each smart growth opportunity area on the Concept Map. The Concept Map is shown in Figure 3.3.

Each place type is defined by targets for intensity and mix of land uses. Existing and planned smart growth opportunity areas already meet the intensity criteria, while potential areas do not. In the Low Carbon Land Use Scenario, allowable uses and intensities in existing and planned smart growth opportunity areas are based on their existing or planned conditions. In potential opportunity areas, land use mix and intensity is based on the place type targets, rather than the land use classifications of local plans, as described below in Table 3.2. Sites outside the smart growth opportunity areas keep their current land use classification from existing local plans. Projected growth is modeled with these new smart growth parameters to determine a likely pattern of regional development under the Low Carbon Land Use Scenario, as illustrated in Figure 3.4.
Figure 3.4 - Projected Housing Growth 2010-2030
Low Carbon Land Use Scenario

Housing Change - Low Carbon Land Use Additional Units per Acre
- Zero or Loss
- 0.01 - 1.00
- 1.01 - 5.00
- 5.01 - 15.00
- More Than 15.00

Enhanced Transit Scenario
MODE:
- Light Rail / Commuter Rail
- Bus Rapid Transit
- Rapid Bus
- Major Roads

N 0 3 6 9 Miles
0 3 6 9 Kilometers

SANDAG
<table>
<thead>
<tr>
<th>Place Type</th>
<th>Residential Intensity (units per acre)</th>
<th>Employment Intensity (jobs per acre)</th>
<th>Percent Residential</th>
<th>Percent Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metropolitan Center*</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Urban Center</td>
<td>40</td>
<td>50</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>Town Center</td>
<td>20</td>
<td>30</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>Community Center</td>
<td>20</td>
<td>n/a</td>
<td>45</td>
<td>20</td>
</tr>
<tr>
<td>Rural Village</td>
<td>10.9</td>
<td>n/a</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>Special Use Center</td>
<td>50</td>
<td>45</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Mixed Use Transit Corridor</td>
<td>25</td>
<td>n/a</td>
<td>25</td>
<td>40</td>
</tr>
</tbody>
</table>

* The only Metropolitan Center opportunity area—the San Diego central business district—already exceeds the place type criteria and is an “existing” opportunity area, so it is not included in this table addressing “potential” areas.

### Outcomes

The Low Carbon Land Use Scenario reduces VMT and GHG emissions by approximately 1.4 percent below BAU levels. An additional 84,000 housing units are developed in smart growth opportunity areas that are more compact and better served by transit. By increasing housing capacity in the region, the scenario also reduces the number of projected inter-regional commuting households by 76,000.

### Modeling Improvements

Despite the modest gains made by the scenario, there is good reason to believe that emissions would be reduced realistically by an even greater amount than is indicated. A growing body of research and practice is demonstrating the need to refine traditional four-step transportation models like SANDAG’s to better measure the effects of smart growth practices. The research suggests that the models underestimate the impact of the 5-Ds of smart growth noted above.

In practice, smart growth reduces trip lengths by placing origins and destinations closer to one another through infill development, density, and mixed uses. Currently, however, the SANDAG model does not vary trip lengths according to the presence of the 5-Ds. Other regional transportation agencies have evaluated their own models and found it appropriate to apply a 5-D “post-processor” tool that modifies trip lengths based on elasticities derived from observed travel behavior. Though SANDAG currently is developing an activity-based transportation model that will more accurately measure smart growth land use impacts, the model will not be ready for use until 2012. In the meantime, 5-D modeling tools will be evaluated and potentially applied to ensure an accurate and full accounting of GHG emissions.
ENHANCED TRANSIT SCENARIO

Two key factors in determining a traveler’s transportation mode choice are the proximity of transit routes to common origins and destinations, and the time entailed in transit trips compared to automobile trips. In transportation planning, these factors are addressed through investments in providing desirable transit routes and operating them at sufficient frequencies of service. To understand how these transportation network investments contribute to the GHG target, the scenario introduces an Enhanced Transit Scenario. The scenario includes the roadway network from the adopted 2030 Regional Transportation Plan: Pathways for the Future (2030 RTP), and a transit network that would provide more extensive coverage and frequent service than the 2030 RTP.4

As with all of the GHG reduction scenario strategies, the Enhanced Transit Scenario is not necessarily recommended as an alternative to the RTP; in any case, the network is not currently feasible given assumptions about available funding sources, as described in the RTP Reasonably Expected Revenue Scenario. Rather, the network is introduced to determine the GHG impact of an incrementally higher level of investment in transit and maintained level of investment for roadways.

Assumptions

As compared to the 2030 RTP, the Enhanced Transit Scenario includes the same roadway network but also contains additional regional bus routes. The network contains new circulator bus service in three central San Diego neighborhoods—Mission Valley, North Park, and City Heights—with ten-minute service all-day, and a new Downtown San Diego circulator bus route with all-day five-minute frequency. The transit network also includes ten-minute all-day service for all Bus Rapid Transit (BRT) routes and regional buses. This constitutes an increase in service for some routes, which have fifteen-minute off-peak service in the 2030 RTP. Finally, the network includes seven and a half-minute all-day headways for Trolley service and twenty-minute all-day service for the COASTER commuter rail. Transit routes in this network are illustrated in Figure 3.5.

4 The Enhanced Transit Scenario is based on the 2030 RTP Reasonably Expected Roadway network and the Unconstrained Revenue transit network, with additional transit enhancements.
Figure 3.5 - Enhanced Transit Scenario: Transit Network
Outcomes

Under this analysis, the Enhanced Transit Scenario is modeled with land use assumptions from the Low Carbon Land Use Scenario, resulting in a GHG emissions reduction of 2.4 percent below BAU conditions. Because transit share increased in modeling the Low Carbon Land Use Scenario alone (with the existing 2030 RTP transportation network), additional emissions reductions from the Enhanced Transit Scenario are approximately one percent, as illustrated in Figure 3.2 at the beginning of this section.

One conclusion to be drawn from these results is that marginal increases in transit investment will not necessarily deliver substantial cuts in emissions unless designed for that objective. For example, increased frequency of service does not necessarily reduce GHG emissions. If more frequent service does not attract proportionally higher ridership, emissions from those routes will increase and not be offset by corresponding decreases from passenger vehicles. While the incremental change in transit investment offered in this enhanced transit scenario does not yield substantial emissions reductions, the share of transit trips increases under every component of the GHG reduction scenario, including land use and TDM strategies. This trend is shown in Table 3.1 at the beginning of this section.

It is also anticipated that improvements in 5-D modeling capabilities will refine the emissions reductions expected from enhanced transit strategies.

TRANSPORTATION DEMAND MANAGEMENT

In addition to regional transportation planning and land use policy coordination, SANDAG can also help to reduce GHG emissions through Transportation Demand Management (TDM) programs. TDM seeks to optimize the efficiency of the transportation system, and can include such overarching strategies as roadway pricing, parking management, incentives for using alternative modes, “511” traffic information systems, and alternative work arrangements that reduce overall and peak travel demand. Currently, SANDAG manages a number of TDM programs, including vanpool and carpool coordination and telecommuting employer education.

The GHG reduction scenario includes four TDM measures that can contribute to VMT and GHG emissions reduction. Aggressive but plausible assumptions are made for telecommuting and pricing strategies, and are tested in concert with the Low Carbon Land Use Scenario and Enhanced Transit Scenario. The four TDM measures, as a whole, reduce GHG emissions by approximately 17 percent. The following section describes the assumptions and outcomes of each TDM measure.

Telecommuting

The scenario includes an ambitious telecommuting assumption to reduce emissions from work trips. Telecommuting allows for the elimination of trips made in the peak-period by allowing employees to work remotely from home, instead of commuting to their traditional work location. Today, many employers offer the option of telecommuting on a limited basis, and the outlook for more frequent and widespread telecommuting is promising. Technology is evolving to the point that videoconferencing and other Web-based communication is becoming a more acceptable and affordable part of the workplace, and the culture of work is changing as this transformation takes place. Telecommuting may be an effective, cost-saving option for reducing GHG emissions.
Based on the SANDAG Regional Growth Forecast, approximately one-third of the region’s jobs in 2030 will be “telecommutable” or suitable for telecommuting. These jobs are primarily computer-based and do not require an onsite presence at all times (such as editors, planners, accountants, etc.). SANDAG’s 2030 RTP currently assumes a 5 percent telecommute share for all office work trips in 2030. For the scenario, this figure was increased to 40 percent of all telecommutable work trips, or two days offsite per work week. This level of telecommuting would reduce VMT and GHG emissions by approximately four percent.

**Regional Carbon Fee**

Travelers make transportation decisions by taking into account multiple costs and benefits, many of which are presented in economic terms. Economic costs associated with vehicular travel include fuel, insurance, and maintenance, but the cost of climate change is not reflected currently in the economic cost of driving. Many studies have analyzed the potential costs of climate change, which include damage from increasingly common storms and floods, the impacts of sea level rise, agricultural losses from drought, and public health costs from heat waves and higher incidences of disease, as well as “non-market” costs such as ecosystem impairment. The Stern Report, produced for the United Kingdom Chancellor of the Exchequer, estimates that the cost of climate change may be equivalent to reducing standards of living by between 5 percent and 20 percent if mitigating action is not taken.

Much of the policy discussion around climate change mitigation is focused on market-based mechanisms for reducing GHG emissions. Cap-and-trade arrangements and carbon taxes both seek to internalize the cost of climate change into the economy. Depending on how policy develops at the state and federal levels, a carbon fee on automobile travel may be one mechanism to account for climate change costs and to bring the region closer to meeting GHG emission targets.

To test this approach, the GHG reduction scenario includes a Regional Carbon Fee based on fuel consumption. The fee is expressed as an additional 20 cent tax on retail fuel. The Regional Carbon Fee would reduce GHG emissions by approximately three-quarters of a percent. In addition to reducing emissions directly, indirect benefits could be realized if revenue from the fee were reinvested into projects that also would reduce emissions.

**Pay-as-you-drive Insurance**

Pay-as-you-drive-insurance (PAYD) charges drivers for insurance based on the number of miles they drive, rather than based on an annual, flat-rate premium. This approach more accurately reflects the risk associated with driving more often. Under such a system, drivers generally would see a reduction in their insurance costs if they drove less than the average motorist, providing an incentive to reduce VMT. PAYD insurance has been included as a TDM measure in multiple state climate action plans and has been piloted by Progressive Insurance in several states, with positive results.

The SANDAG analysis assumes that PAYD insurance would reach 100 percent market saturation. The per mile rate was based on the 2005 average California annual insurance cost of $845, which was divided by current average regional VMT to determine a rate of six cents per mile. PAYD insurance provides an additional one percent reduction in GHG emissions.
Smart Growth Parking Fees

In select locations in the region, parking fees also may result in GHG emissions reductions. Today, parking usually is provided to drivers free of charge, despite the high cost of dedicating land exclusively to car storage. Parking is required in minimum parking standards attached to development projects, and some argue that this approach passes costs on from developers and owners to tenants and customers, resulting in generally higher prices for goods and services associated with the building. By reducing parking requirements and instead developing priced parking on-street and off-street, more of the cost of parking is borne by the drivers that use it. In addition to potentially being a more efficient and equitable parking solution, parking fees can provide a disincentive to driving in places where alternatives are available, and therefore may result in reduced GHG emissions.

Parking fees are not appropriate in locations where driving is the only option. However, the concept behind regional smart growth opportunity areas, as identified in the Smart Growth Concept Map, is that alternatives such as walking, bicycling, and transit are made available through coordinated land use and transportation planning. Travelers in these areas will have more transportation alternatives, and will be more likely to consider using an alternative if they know they will be charged for parking.

To evaluate this concept, parking zones are established in opportunity areas and are priced based on the place type, as described in Table 3.3. Under this scenario, higher charges are incurred in opportunity areas with higher densities and mixed uses, and parking is not charged at residential uses. Modeled with the Low Carbon Land Use Scenario and Enhanced Transit Scenario, these smart growth parking fees result in an emissions reduction of approximately 12 percent, a greater contribution than any other single strategy modeled in the GHG reduction scenario. Like the Regional Carbon Fee, the strategy generates revenue that could be used to implement additional climate change mitigation policies, with a focus on mitigating any negative impacts on opportunity areas where parking fees are collected.

The smart growth parking zones are illustrated in Figure 3.6.
### Table 3.3 - Smart Growth Parking Fees

<table>
<thead>
<tr>
<th>Place Type</th>
<th>Parking Zone</th>
<th>Parking Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metropolitan Center</td>
<td>5</td>
<td>$3/hour</td>
</tr>
<tr>
<td>Urban Center</td>
<td>4</td>
<td>$2.25/hour</td>
</tr>
<tr>
<td>Town Center</td>
<td>3</td>
<td>$1.50/hour</td>
</tr>
<tr>
<td>Community Center</td>
<td>2</td>
<td>$1.00/hour</td>
</tr>
<tr>
<td>Transit Corridor</td>
<td>2</td>
<td>$1.00/hour</td>
</tr>
<tr>
<td>Special Use Center</td>
<td>3</td>
<td>$1.50/hour</td>
</tr>
<tr>
<td>Rural Community</td>
<td></td>
<td>No charge</td>
</tr>
</tbody>
</table>

### ADDITIONAL TRANSPORTATION STRATEGIES FOR CONSIDERATION

The strategies above were modeled to determine their impact on emissions, but other measures that were not modeled also could contribute to emissions reductions as described below.

#### Roadway Pricing

Roadway pricing charges motorists a fee for utilizing a certain road, road segment, or district. The fee can be a flat rate, as in the case of toll roads, or can be made variable depending on the level of congestion at a given time, as in congestion pricing. Roadway pricing provides a disincentive to vehicular travel that could result in reduced GHG emissions. The 2030 RTP currently includes “managed lanes” on several freeways in the region. These managed lanes implement a form of congestion pricing, in which single-occupancy vehicle drivers can choose to pay a variable fee based on congestion to utilize the lanes, which are otherwise reserved for high-occupancy vehicles and transit. Other types of congestion pricing could be considered as part of the RCAP.

#### Ridesharing

Carpools and vanpools are forms of ridesharing that also could reduce GHG emissions by reducing single-occupancy vehicle trips. The SANDAG travel model includes two-person and three-person carpools in its allocation of trips to various modes of transportation; in this respect, ridesharing is reflected in the projected emissions of all the strategies evaluated in the GHG reduction scenario. However, the introduction of new ridesharing policies, programs, and incentives could further reduce VMT.
CITY OF CHULA VISTA DRAFT IMPLEMENTATION PLANS FOR CLIMATE CHANGE

City of Chula Vista staff is seeking comment from EWG members on its draft implementation plan for seven climate change measures adopted by City Council in April 2008. The climate protection measures were recommended by Chula Vista’s Climate Change Working Group and adopted by the Chula Vista City Council. The implementation plans can be downloaded from the following website: http://www.chulavistaca.gov/clean/conservation/Climate/ccwg1.asp

Chula Vista staff Brendan Reed will give a presentation to the EWG.

Key Staff Contact: Brian Holland, 619-699-6915; bho@sandag.org