February 2018

Review of the San Diego County Climate Action Plan Transportation and Land Use Component

Prepared for the Cleveland National Forest Foundation

Norm Marshall, President

Executive Summary

I have reviewed the *Land Use and Transportation* component of the County of San Diego Climate Action Plan (Final, January 2018). The CAP reports that this sector produces 45% of current GHG emissions in the unincorporated part of the County. I found the following deficiencies in the CAP:

1) The Climate Action Plan (CAP) relies too much on carbon offsets in 2030 and has no mitigation plan for 2050.

2) The CAP fails to demonstrate that this critical offset program is even feasible.

3) The CAP does not adequately account for land use impacts within its control, including increases due to General Plan Amendments (GPAs).

4) The CAP fails to account for induced travel from expanded roadway capacity – both for new County roads, and for regional road expansion.

5) The CAP fails to include transit in a substantial way.

6) The CAP included no alternative that addresses the *Land Use and Transportation* component, the sector with the greatest GHG emissions.

7) An alternative should have been included that reduced future development, particularly in areas that are not currently served by transit, and that also included less County and regional road expansion, and regional transit expansion.

8) Such an alternative could meet the 2030 target without the offset program, and make a much better start towards meeting the 2050 goal than the CAP alternative.

9) The CAP also should have included an alternative with reduced future development, but without regional transit expansion.

The Author's Experience

Norm Marshall, President, helped found Smart Mobility, Inc. (SMI) in 2001. Prior to this, he was at RSG, Inc. for 14 years where he developed a national practice in travel demand modeling. He specializes in analyzing the relationships between the built environment and travel behavior, and doing planning that coordinates multi-modal transportation with land use and community needs. Mr. Marshall manages all SMI projects, and is involved heavily in every aspect of the modeling and planning process.

Mr. Marshall graduated from Worcester Polytechnic Institute in 1977 with a B.S. in Mathematics and from Dartmouth College in 1982 with a M.S. in Engineering Sciences. This graduate program included coursework in transportation modeling.

Mr. Marshall has over 30 years of experience in regional transportation modeling, and has managed transportation projects in over 30 U.S. States. He has developed more than a dozen regional transportation models, and has reviewed several dozen others.

He has many peer-reviewed publications and presentations. These include: "A Statistical Model of Regional Traffic Congestion in the United States" presented at the 2016 Annual Meeting of the Transportation Board, and two presentations at the 2017 Planning Applications Conference of the Transportation Research Board: "Assessing Freeway Expansion Projects with Regional Traffic Assignment" and "Pre-Destination-Choice Walk Mode Choice Modeling."

Mr. Marshall has extensive experience with California's regulation of GHG under Senate Bill 375. This includes working with Climate Plan in the initial target setting process (2010), and managing a $250,000 contract with the California Air Resources Board (CARB) to review how well the models account for GHG emissions (2012-2015). In the CARB project, the University of California was a subcontractor to SMI.

On-Road Vehicle GHG Reduction Regulation in the San Diego Region

Assembly Bill 32 (2006) required California to reduce its greenhouse gas (GHG) emissions. Following guidance by the California Air Resources Board (CARB), the San Diego County Climate Action Plan (CAP) is intended to reduce GHG emissions in the unincorporated area of the County relative to 2014 levels by 2% in 2020, 40% by 2030 and 77% by 2050. (CAP p. ES-4) The sector with the greatest emissions is "on-road vehicles", accounting for 45% of County GHG emissions in 2014. (CAP Table 2.1 p. 2-6) This review is limited to this *Land Use and Transportation* component of the CAP.

This review considers other related documents and information including:

- County General Plan: The CAP: "*updates and implements*" the County's General Plan (CAP p. ES-2). Therefore, the *Mobility* section of the General Plan is cited in this review. This review includes the transportation elements, the land use elements, and goals for regional planning and inter-jurisdictional coordination.

- CARB documents: Senate Bill (SB) 375 builds on AB 32 with specific guidance and methods for accounting for transportation GHG and GHG reductions. The CARB is charged with implementing AB 32 and SB 375 including promulgating guidance and regulations, and approving plans. Several CARB documents are cited in this review.

- SANDAG documents and data: In general, SB 375 is administered at the Metropolitan Planning Organization (MPO) level. In San Diego County, the MPO is the San Diego Association of Governments (SANDAG). The transportation component of the CAP makes extensive use of data and assumptions in the 2015 SANDAG Regional Transportation Plan (RTP). The numbers in the RTP are taken from SANDAG's regional transportation model. This review makes several references to the SANDAG RTP and to the underlying transportation modeling.

Deficiencies in the CAP

Overreliance on Offsets in 2030 and No Plan for 2050

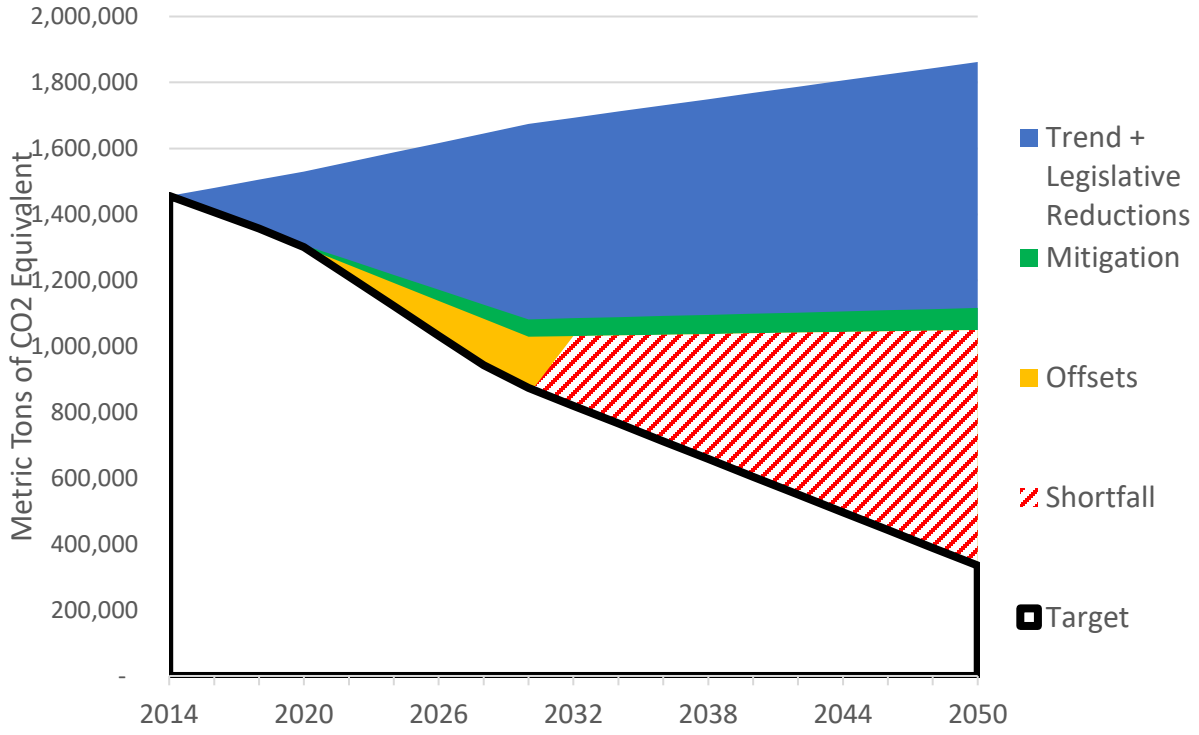
The CAP estimates that on-road vehicle travel produced 1.456 million tons of CO2 equivalent in 2014, 45 percent of all GHG in the unincorporated part of the County. (CAP Figure 2.1, p. 2-5 and Table 2.3, p. 2-8) The CAP credits 8.8 million VMT per day to the unincorporated part of the County in 2014 and projects that this will grow to 11.3 million VMT per day in 2050, an increase of 28%. (CAP Appendix A, Table 44, p. 48)

If the mix of vehicles (gas, diesel, electric) and the average fuel efficiency were unchanged, this 28% increase in VMT would result in a corresponding 28% increase in on-road vehicle GHG. However, the CAP uses a baseline of "Emissions with Legislative Reductions", i.e. improved vehicle efficiency standards and increased electric vehicle mode share. Trends in these directions are already occurring throughout the U.S. due to a combination of technological improvement (in electric vehicles and fuel efficiency) and Federal standards, but California standards go beyond the national trends.

Figure 1 shows on-road transportation GHG for the period 2014-2050:

- Baseline with current vehicle mix and fuel efficiency
- CAP baseline with trends and legislature reductions
- Mitigation reductions
- Offsets (from non-transportation projects as discussed below)
- Target: 40% reduction from 2014 in 2030, and 77% reduction in 2050. (CAP p. 3-2)

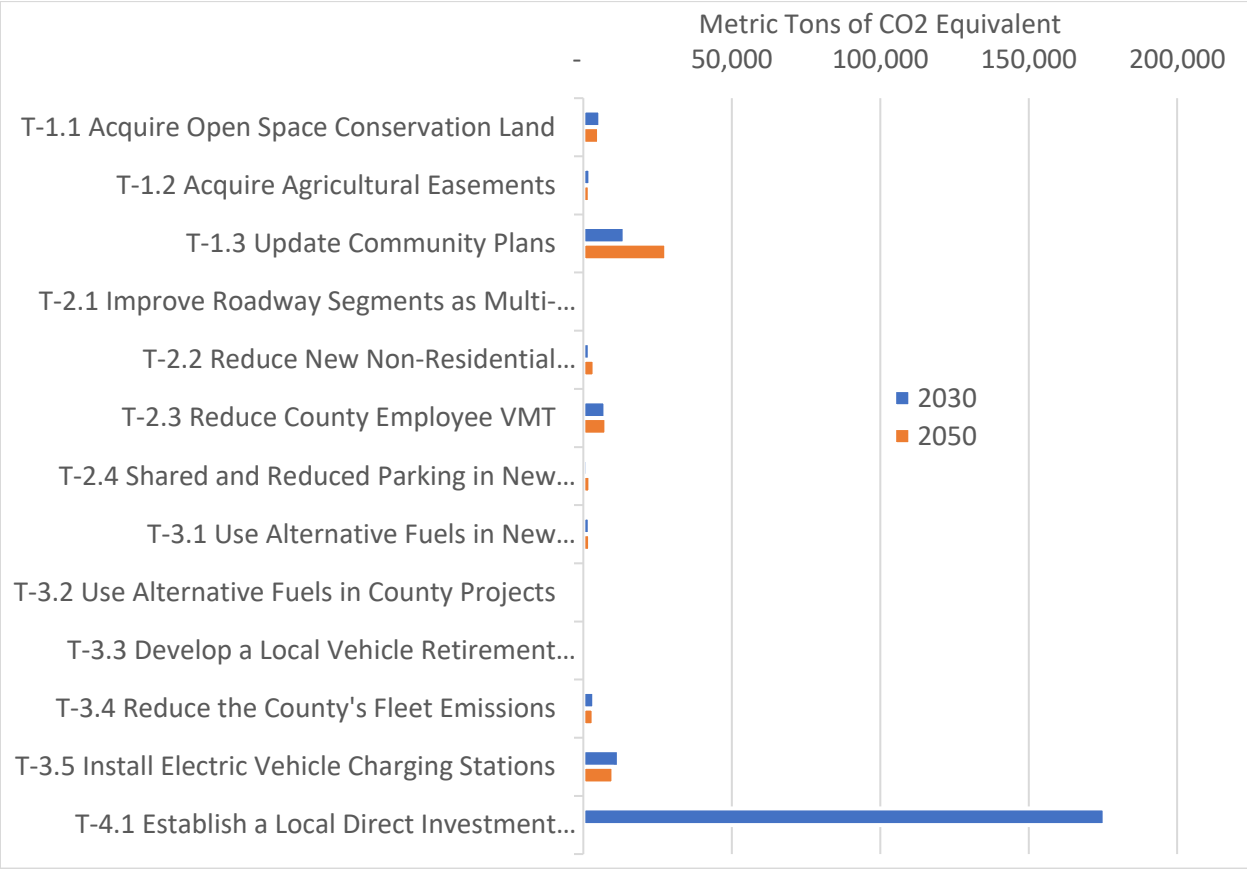
Figure 1: On-Road Transportation GHG



The Target line in Figure 1 shows the 77% decrease in GHG that is required between 2014 and 2050. The top of the blue area shows the GHG that would result from growing VMT without changes in fuel efficiency and vehicle mix. The size of the blue area shows that improved fuel economy and more electric vehicles are expected to contribute half of the required reductions between 2014 and 2050.The mitigation included in the CAP only contributes only 9% of the remaining required 2050 reductions. The CAP fails to mitigate the other 91% at all.

Even in 2030, the CAP indicates that less than ¼ of the needed mitigation will be done through reducing VMT. More than ¾ would instead result from offsets from other sectors of the economy. Figure 2 shows the expected mitigation amounts for each strategy in 2030 and 2050. (CAP p. 3-9 - 3-41)

Figure 2: CAP GHG Reduction from Built Environment and Transportation Mitigation



As shown in Figure 2, over ¾ of the reductions in 2030 are from an offset program: "T-4.1: Establish a Local Direct Investment Program." It would be hoped that some of these offsets would continue past 2030. However, details are lacking. As reproduced in Figure 3, the CAP shows a large reduction for offsets in 2030 and no reduction in 2050. An offset of 175, 460 was calculated to "close" the target gap in 2030. However, no reduction for offsets in 2050 has been included. There is a huge shortfall between the projected emissions and the target that grows through the period between 2030 and 2050 to 715,000, i.e. more than 4 times the offset amount in 2030. As discussed in the next section, the level of offsets assumed in 2030 is likely infeasible. There is no possibility of closing the 2050 gap with offsets. The failure of the CAP to include significant true mitigation in the early years would dig the County into a deep hole that there is no plan to get out of.

Figure 3: Offset GHG Emission Reductions from CAP (image copied from CAP p. 3-40)

MEASURE SUMMARY

Close the 2030 GHG emissions reductions target gap of 175,460 $MTCO_2e$ through direct investments in local projects that would reduce carbon emissions within the unincorporated county by 2030

GHG EMISSIONS REDUCTIONS	
2020 Anticipated GHG Reduction	0
2030 Anticipated GHG Reduction	175,460
2050 Anticipated GHG Reduction	0

Relying on offsets for over ¾ of the mitigation in 2030 is contrary to the spirit of GHG regulation in California. A recent CARB staff report states:

> *The Scoping Plan Update recognizes the role that reducing growth in VMT plays in supporting other important public health, equity, economic, and conservation goals. The types of strategies associated with reducing VMT growth also influence where and what types of development are put in place, with implications beyond reducing distances traveled and tailpipe emissions. Development pattern choices also play a role in influencing pollutant exposure; accessibility to jobs and services; future transportation, energy, and water infrastructure demand and costs; as well as conversion of natural and working lands; food security; watershed health; and ecosystems…*
>
> *CARB staff believes that to achieve the intent of the legislation and to maximize community co-benefits, the per capita GHG emission reduction targets should be achieved predominantly through strategies that reduce VMT."*[1]

As discussed below, the County could and should have done much more to mitigate VMT growth and resulting GHG before resorting to the "magic bullet" of offsets.

Failure to Demonstrate that the Offset Plan is Even Feasible

The CAP states:

> *The County will collaborate with the San Diego County Air Pollution Control District (SDAPCD) to develop and implement a local direct investment program by establishing an independent registry or joining an existing registry, such as the California Air Pollution Control Officers Association (CAPCOA) Greenhouse Gas Reduction Exchange (GHG Rx), using protocols approved by the California Air Resources Board (CARB),*

[1] CARB, Final Staff Report: Proposed Update to the SB 375 Greenhouse Gas Emission Reduction Targets, p. 12, 19. October 2017.
https://www.arb.ca.gov/cc/sb375/final_staff_proposal_sb375_target_update_october_2017.pdf

> *such as the GHG Rx, Climate Action Reserve, Verified Carbon Standard, and/or American Carbon Standard.* (p. 3-40)

This is a large undertaking that is scheduled in the CAP for 2020 (p. 3-41). There is a significant risk that this effort will be delayed or even derailed.

Even if the development and implementation proceeds smoothly, there is no guarantee that the required offsets will be available when they are needed. The CAP states: "*Progress toward the 2030 target will be monitored over time, and through future CAP updates the level of local direct investments can be adjusted as needed to achieve the 2030 target reductions"* (p. 3-40). However, SANDAG only updates VMT modeling every 5 years, and then is benchmarked to a previous year. For example, the CAP (2018) is relying on the SANDAG RTP (2016) with 2014 data. Therefore, timely monitoring appears to be infeasible.

Developing, documenting, and certifying each project generally takes several years. The CAP uses the word "local" many times to refer to the offset program. However, the word local is never defined. Does "local" mean that the projects are all located within the unincorporated areas of San Diego County? If so, the number of potential projects is severely restricted. The Climate Action Reserve California Offset Project Registry[2] currently lists 517 projects – not all of which are CARB eligible. Of these 517 projects, 82 are located in California, but only 1 of these is in San Diego County, and that one is a forest restoration project that is not eligible. If "local" means something else, the CAP should clearly state that. If "local" is something that can be waived, as can be done with project applicants as discussed above, the CAP should make this clear.

Offset accounting is very complicated. The CAP includes 2,631 pages of guidance on offset accounting. (CAP Environment Report Appendix B) The complexity of compliance makes small projects, and many larger projects infeasible.

Even when all these reporting requirements are satisfied, it is very difficult to know whether the offset projects make a real difference in the planet's health. The CARB-eligible project in the California Offset Project Registry with the largest number offset credits registered is for 393 square miles high-elevation forest (generally above 7,000 feet) in New Mexico with relatively sparse forest cover. Relatively small benefits per acre translate into big savings when multiplied across 393 square miles. Certainly, little of this area is likely to have a significant change in use, with or without this program. The project promises better forest management, but there is no way to know that the better management would not have occurred without the offset program. The complexity of the offset program, and the requirement for complex modeling is certain to result in some inaccuracy, and potentially in fraud. These uncertainties are one of the reasons that CARB limits the use of offsets in the Cap-and-Trade program to no more than 8% of the total.[3] Concerning this 8% maximum, Environmental Defense Fund comments: "*This creates a path for high-quality, low-cost emissions reductions while ensuring the majority of reductions are made directly by the largest polluters."*[4] This is sharp contrast to the greater than 75% reliance on offsets in the CAP documented above.

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[2] http://www.climateactionreserve.org/how/california-compliance-projects/compliance-offset-projects/
[3] CARB. California's Cap-and-Trade Program: Publicly Available Information. https://www.arb.ca.gov/cc/capandtrade/public_info.pdf
[4] Environmental Defense Fund April 2012. https://www.edf.org/sites/default/files/OffsetsPercentagesFAQFinal%20041612.pdf

Attachment H-4 in the CAP EIR is a table entitled "*Local Direct Investment Protocol Research: Similar Programs or Registered Projects in California*." Six of the entries are listed for San Diego County, all of which are general areas that are present in multiple counties. These include:

- Improved Efficiency of Vehicle Fleets
- Methodology for Carpooling
- Urban Tree Planting
- Organic Waste Digestion
- Organic Waste Composting
- Landfill Gas Capture and Destruction/Use

All six of these reference the City of San Diego CAP. Presumably, the City of San Diego is taking credit for these reductions rather than selling offsets to the County. Furthermore, the activities listed would likely be advancing without an offset program, because they all represent good planning that achieve other objectives. Therefore, Attachment H-4 includes no local projects that could be part of the San Diego County offset program.

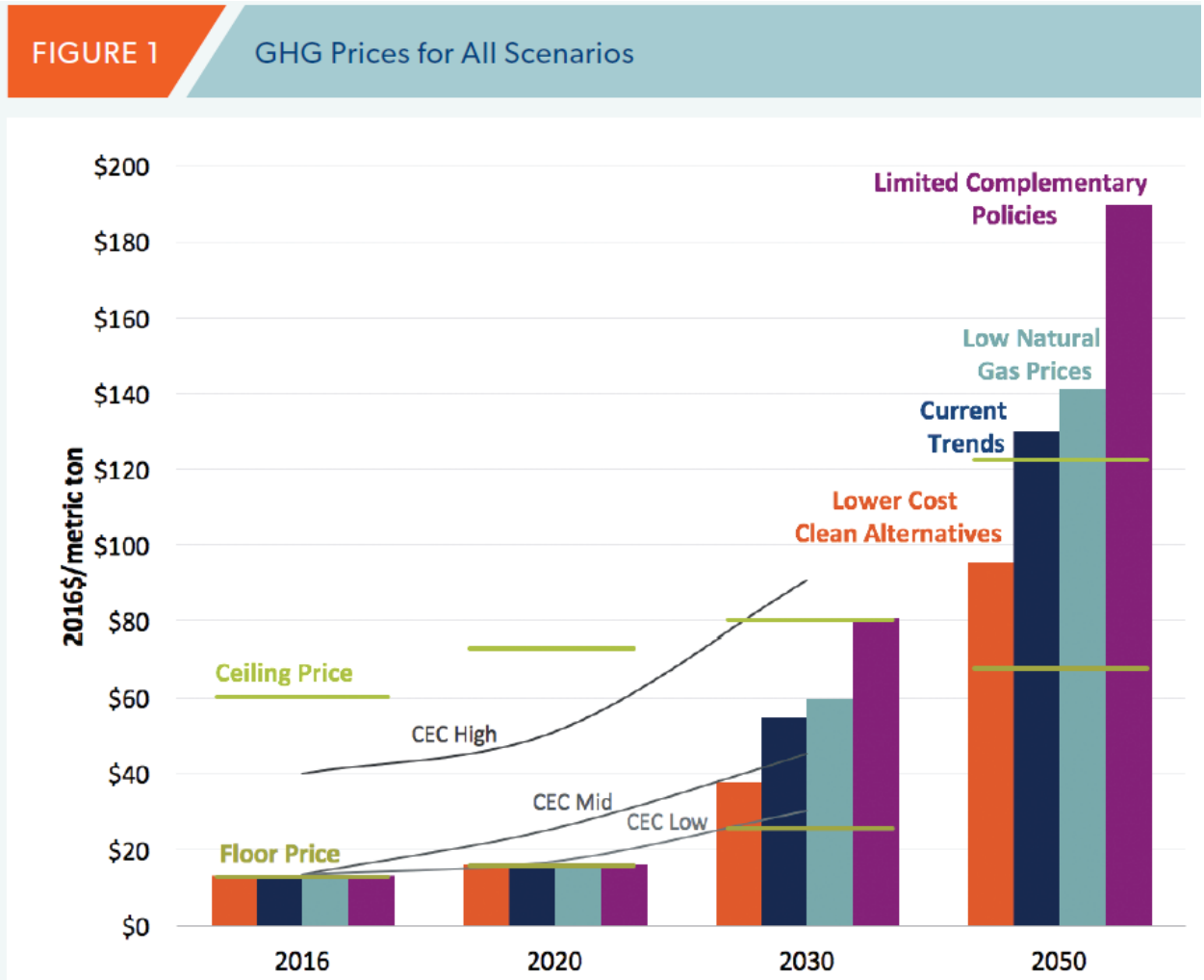
CAP EIR Attachment H-3 states: "*Ramboll Environ estimates that the County could obtain anywhere from 50,100 to 198,800 MT in CO2e reductions in 2030 through implementation of a local direct investment measure.*" (p. 9) The most important thing to note about this is that the 175,000 MT in CO2e assumed in the CAP is 3 ½ times the lower bound in this estimate. This indicates that the CAP itself does not conclude that a purely "local" program is feasible. Even for the local projects, the County would be competing with other customers for these offsets, including many industrial entities in the Cap-and - Trade market. If the County were to seek offsets outside the County, there likely will be intense competition for those offsets as well.

The CAP notes that the cost for these offsets is "High" (p. 3-41). CAP EIR Appendix H-3 states: "*Ramboll Environ estimates that direct costs may reach $14 to $55 million in 2030 as the County builds its program to meet the 2030 GHG reduction goal*." (CAP EIR, Attachment H-3, p. 1) The actual cost is currently unknowable. The price of offsets is dynamic, but should generally track the price of GHG on California's Cap-and-Trade market because many potential customers can substitute one for the other. There are a wide range of forecasts for future pricing of GHG. A recent comprehensive analysis with multiple scenarios was done by the Brattle Group.[5] Figure 4 reproduces a summary figure from this report.

As shown in Figure 4, the Brattle Group expects GHG prices to increase from current prices by a factor of 2 to 5 by 2030, and by a factor of 5 to 10 by 2050. If restricted to a small set of potential projects due to a "local" requirement, the prices could be even higher. The CAP does not identify a funding source for these payments. The CAP fails to show that the proposed offset plan is feasible - either in terms of projects, or financially. Therefore, it cannot be relied on. The CAP should not defer true mitigation based on this sketchy offset program.

[5] Yang, Y., M Hagerty, A. Palmarozzo, M. Celebi, M. Chupka nd H. Sheffield. The Future of Cap-and-Trade Program in California: Will Low GHG Prices Last Forever? Brattle Group, December 2017. http://www.ourenergypolicy.org/wp-content/uploads/2017/12/The_Future_of_Cap-and-Trade_Program_in_California_Final_12.4.17.pdf

Figure 4: Brattle Group GHG Price Forecasts for Four Scenarios



Inadequate Accounting of Land Use Growth Impacts on GHG

Appendix A of the CAP tabulates existing (2014) population, households and jobs within the unincorporated part of San Diego County. Excluding Camp Pendleton and Native American Reservations, the totals are:

- Population 454,599 (Table 1, p. 2)
- Housing units 163,354 (Table 3, p. 3)
- Jobs 85,742 (interpolated, Table 3, p. 3)

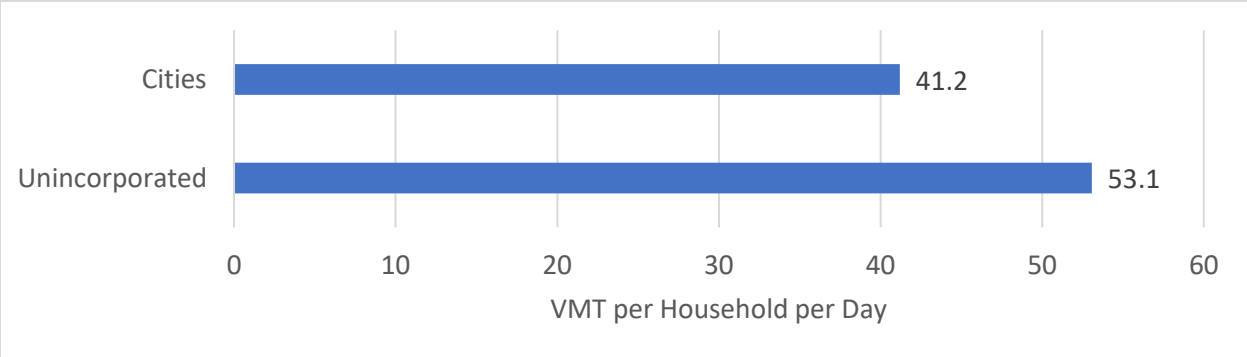
These data indicate that there are 0.52 jobs per housing unit in the unincorporated portion of the county today. This is in sharp contrast to the data for the county as a whole that also are tabulated in Appendix A of the CAP. These totals are:

- Population 454,599 (Table 1, p. 2)
- Housing units 1,186,785 (Table 3, p. 3)
- Jobs 1,390,272 (interpolated, Table 3, p. 3)

For the county as a whole, there are 1.17 jobs per household. If residents in the unincorporated area hold 1.17 jobs per household on average, this represents a shortfall of 106,000 jobs in the unincorporated area in 2014. This jobs/housing imbalance obviously causes longer commutes for those residing in the unincorporated area, on average, than for other county residents. Less obviously but even more importantly, in our service economy, other trips including shopping trips and medical trips are also longer on average for those living in the unincorporated areas.

The results of these longer trips can be seen in the California Household Travel Survey (CHTS) data. The CHTS includes day-long trip diaries from 1,689 households in San Diego County in 2012, including 1,456 household from the county's 18 cities and 232 households from the unincorporated area. The households within the 18 cities averaged 41.2 VMT per capita per day, and those in the unincorporated areas averaged 53.1 VMT per day – 29% higher (Figure 5).[6]

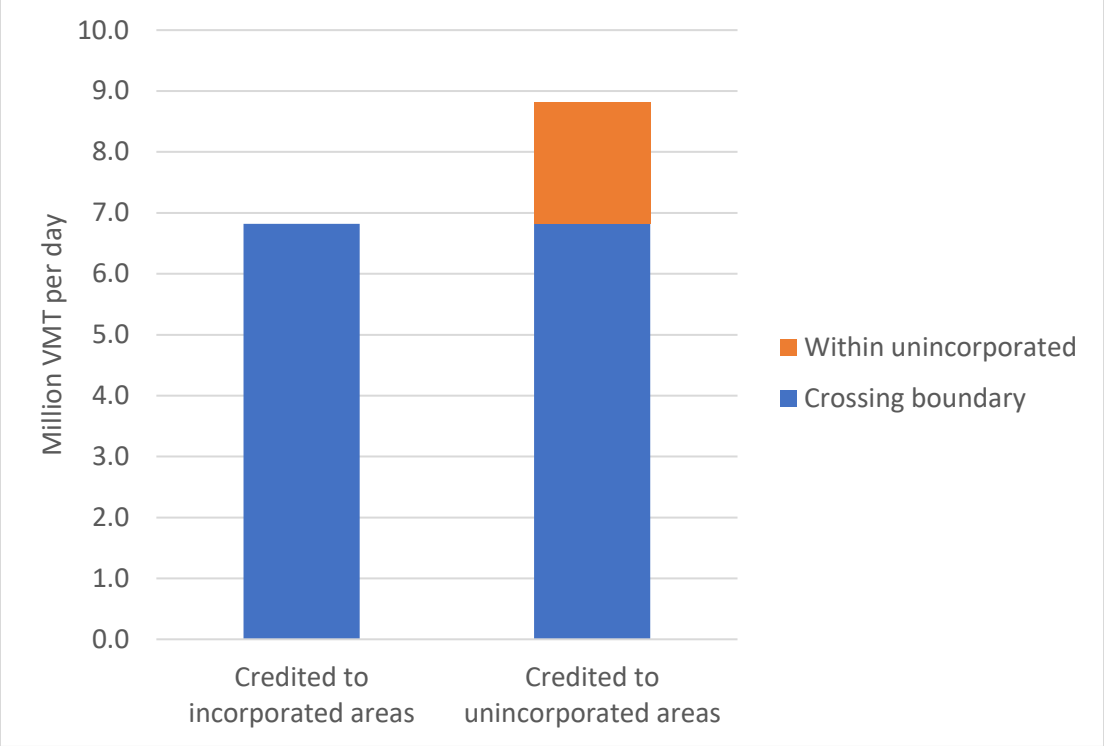
Figure 5: Average Daily VMT per Household: Cities vs. Unincorporated Area



[6]Computed from data described in Nustats, *2010-2010 California Household Travel Survey Final Report*, June 2013. http://www.dot.ca.gov/hq/tsip/FinalReport.pdf

Throughout California, the greater VMT that results from dispersed land use has complicated SB 375 regulation. The VMT that results from these outlying land uses is not neatly contained. In many cases, long trips cross MPO boundaries. In San Diego County, the CAP states that only 13% of the VMT originating or ending in the unincorporated area is totally contained within the unincorporated area. The other 87% of the VMT involves trips that begin or end outside the unincorporated area. This VMT is credited half to the unincorporated area and half to the incorporated areas[7](see Figure 6).

Figure 6: 2014 VMT From Trips in Unincorporated County (CAP Appendix A Table 8 p. 9)



The poor jobs/housing balance in the unincorporated area is expected to continue. CAP Appendix A includes population, housing and job projections through 2050. For the unincorporated area (not including Camp Pendleton and Native American reservations) these are:

- Population 600,560: increase of 145,961 (Table 1, p. 2)
- Housing units 213,486: increase of 50,132 (Table 3, p. 3)
- Jobs 129,788: increase of 44,046 (interpolated, Table 3, p. 3)

If these numbers are accurate, the jobs/housing ratio would increase from 0.52 to 0.61. However, the county projects show an increase in the county jobs/housing ratio from 1.17 to 1.21. If residents in the unincorporated area hold 1.21 jobs per household in 2050, this represents a shortfall of 129,000 jobs in the unincorporated area in 2050 (up from 106,000 in 2014). Therefore, it should be expected that the unincorporated areas will continue to produce higher VMT per household, on average, than more central areas.

[7] This is a method adopted by CARB in the early implementation of SB 375. It has been criticized extensively, but no better method has been adopted.

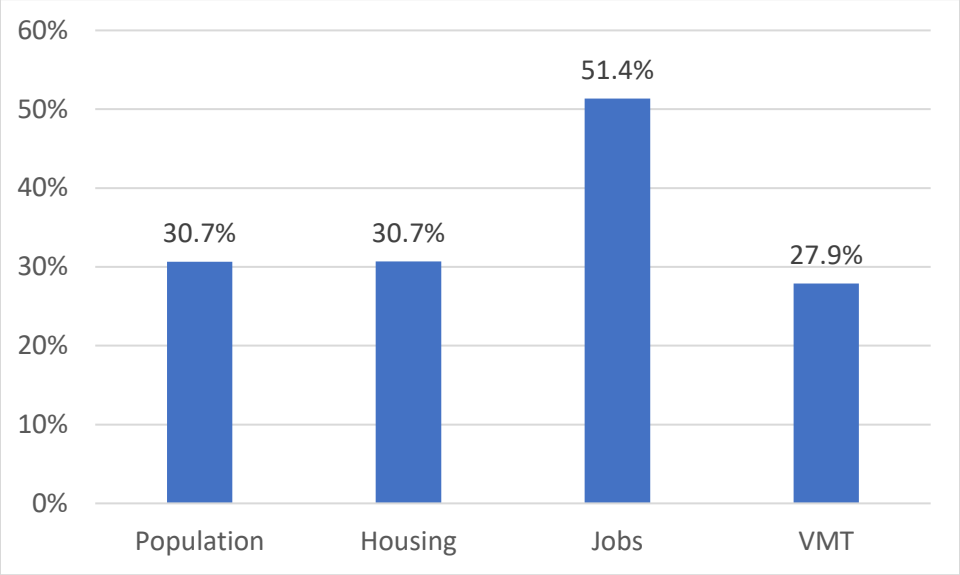
One of the primary ways to address this imbalance would be for the County to coordinate with other agencies and the County General Plan calls for such regional coordination:

> ***GOAL LU-4***
> ***Inter-jurisdictional Coordination.*** *Coordination with the plans and activities of other agencies and tribal governments that relate to issues such as land use, community character, transportation, energy, other infrastructure, public safety, and resource conservation and management in the unincorporated County and the region.*
>
> ***LU-4.1 Regional Planning.*** *Participate in regional planning to ensure that the unique communities, assets, and challenges of the unincorporated lands are appropriately addressed with the implementation of the planning principles and land use requirements, including the provisions of SB375.*
>
> ***LU-4.2 Review of Impacts of Projects in Adjoining Jurisdictions.*** *Review, comment, and coordinate when appropriate on plans, projects, and proposals of overlapping or neighboring agencies to ensure compatibility with the County's General Plan, and that adjacent communities are not adversely impacted.*
>
> ***LU-4.3 Relationship of Plans in Adjoining Jurisdictions.*** *Consider the plans and projects of overlapping or neighboring agencies in the planning of unincorporated lands, and invite comments and coordination when appropriate.* (General Plan, p. 3-26).
>
> **COS-20.3 Regional Collaboration.** Coordinate air quality planning efforts with federal and state agencies, SANDAG, and other jurisdictions. (General Plan, p. 5-39)

More effective regional coordination would reduce the jobs/housing imbalance in the unincorporated area of San Diego County, and would reduce VMT and GHG for the entire County.

SANDAG predicts the percentage of unincorporated area VMT growth between 2014 and 2050 (CAP Appendix A, Table 44, p. 48) to be similar to the percentage growth in population, housing and jobs (Figure 7). It appears that the VMT growth would be more or less proportional to the growth in population and housing, except that it has moderated slightly in the model by the better projected balanced between jobs and housing.

Figure 7: CAP Projected 2014-2050 Growth Rates of Population, Housing, Jobs and VMT



Taking this apparent linkage one step further, it appears that the growth in VMT could be eliminated by eliminating the growth in population and housing, or at least mitigated by reducing the amount of population and housing growth assumed. Furthermore, shifting some of the projected population growth to the cities in San Diego County would not just shift VMT from one place to another, it would reduce total VMT because of the lower average VMT per household in the cities documented above.

The CAP does not consider different population, housing and job projections. It is implied that the SANDAG projections are both accurate and inviolable. In reality, both the overall quantity of growth and the locations of that growth are highly uncertain. In particular, the projected improvement in jobs/housing balance may be more aspirational than likely. Furthermore, County policies will have direct impacts on the magnitude, locations and character of this future development. The CAP documents that the County's recently adopted General Plan amendments (GPAs) "*would result in additional population, job, and housing growth in the Unincorporated County beyond SANDAG's projections*." (CAP, Appendix A, p. 2) This proves both that the land use projections used in the CAP are not certain, and that they have been and can continue be exceeded through action by the County itself. The CAP must consider a range of demographic forecasts, and document how GHG will be mitigated if the assumed projections and resulting VMT area exceeded, and/or document how County policies will prevent the assumed projections from being exceeded.

Furthermore, the CAP leaves the door open for relying even more than 75% on offsets for 2030. The CAP allows applicants for future GPAs to avoid real GHG mitigation through purchasing additional offsets beyond those accounted for in the CAP. The CAP states that:

> "*the GPA applicant or its designee shall first pursue offset projects and programs locally within the unincorporated areas of the County of San Diego to the extent such direct carbon offset credits are available and financially feasible, as reasonably determined by the Director of PDS*." (CAP, p. 7-4) However, the CAP continues: "*The County will consider, to the satisfaction of the Director of Planning & Development Services (PDS), the following geographic priorities for GHG reduction features, and GHG reduction projects and programs: 1) project design features/on-site reduction measures; 2) off-*

> *site within the unincorporated areas of the County of San Diego; 3) off-site within the County of San Diego; 4) off-site Chapter 7 Mitigation Measures County of San Diego Supplement to the 2011 GPU within the State of California; 5) off-site within the United States; and 6) off-site internationally*." (CAP, p. 7-5 - 7-6)

Therefore, the CAP includes no limit on the amount or the geographic area for these GPA offsets. This certainly will increase VMT and GHG, and there is no way to quantify the increases. This is completely contrary to the spirit of SB 375. The CARB 2017 Scoping Plan Update states:

> *To the degree a project relies on GHG mitigation measures, CARB recommends that lead agencies prioritize on-site design features that reduce emissions, especially from VMT, and direct investments in GHG reductions within the project's region that contribute potential air quality, health, and economic co-benefits locally.*

An important reason why CARB staff prefer VMT reduction to other measures is that VMT reduction implies important co-benefits including: "*pollutant exposure; accessibility to jobs and services; future transportation, energy, and water infrastructure demand and costs; as well as conversion of natural and working lands; food security; watershed health; and ecosystems.*"[8]

It also is contrary to the County's General Plan. Goal COS-14 states:

> ***Land Use Development Form.*** *Require that development be located and designed to reduce vehicular trips (and associated air pollution) by utilizing compact regional and community-level development patterns while maintaining community character. (General Plan, p. 5-34)*

The CAP should have included an alternative with reduced development, and strict limits on future GPAs.

[8] CARB, Final Staff Report: Proposed Update to the SB 375 Greenhouse Gas Emission Reduction Targets, p. 12, 19. October 2017.

Failure to Account for Induced Travel from Roadway Expansion

Dispersed land use growth in the unincorporated areas of San Diego County is supported and encouraged by expansion of regional roadways and construction of new roadways. The CAP: "*updates and implements*" the County's General Plan (CAP p. ES-2). The CAP itself is silent about roadway expansion, but the General Plan states: *"A portion of the Mobility Element road network depicted in the Mobility Element Network Appendix is currently in place, and the remainder will need to be constructed as development proceeds*" (General Plan 2011, p. 4-11). Therefore, the General Plan makes a direct connection between expansion of the County roadway network and additional dispersed development. The CAP should acknowledge this connection, and include an alternative with reduced roadway expansion.

As discussed above, the CAP states that only 13% of the VMT from trips beginning or ending in the unincorporated part of the county are from travel that is made entirely within the unincorporated part of the county. The General Plan acknowledges the importance of the regional roadway network in supporting travel to and from the unincorporated area:

> *State highways and regional arterials in the unincorporated County are part of an extensive regional network that is integrated with an interstate highway system that provides intra- and interregional travel within and through the unincorporated County…* (General Plan, 2011, p. 4-4 – 4.5)

The continued expansion of the regional roadway network is causing increased regional VMT and GHG. The increased VMT is called "induced travel." Researchers study induced travel using "elasticity," a term from economics. The elasticity is the ratio between the change in demand and the change in supply or price. For example, if gasoline price increased by 100% and gasoline consumption dropped by 10% (in the short run), the short-term elasticity of gasoline consumption to price would be 10%/100% = 0.10.

In work for the CARB, researchers at the University of California and the University of Southern California reviewed the literature on induced travel and concluded:

> *Thus, the best estimate for the long-run effect of highway capacity on VMT is an elasticity close to 1.0, implying that in congested metropolitan areas, adding new capacity to the existing system of limited-access highways is unlikely to reduce congestion or associated GHG in the long-run.* [9]

This conclusion is based on a thorough review of 20 research papers on induced travel published between 1997 and 2012. An elasticity of 1.0 between VMT and roadway capacity means that there is no net reduction in congestion. Instead there is a proportional increase in VMT and GHG emissions. For example, a 10 percent increase in freeway capacity would cause a 10 percent increase in VMT. (Roadway capacity is generally counted in terms of "lane miles" where a lane mile is 1 lane for 1 mile.) The California Office of Planning and Research (OPR) *Technical Advisory on Evaluating Transportation Impacts in CEQA* accepts this elasticity of 1.0.

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[9] Handy, Susan and Marlon G. Boarnet. "Impact of Highway Capacity and Induced Travel on Passenger Vehicle Use and Greenhouse Gas Emissions: Policy Brief" prepared for California Air Resources Board, September 30, 2014.

It is often claimed that induced VMT will not translate directly into induced GHG because roadway expansion will reduce emissions per mile, but this argument is predicated on the assumption that there will be less congestion. Congestion bottlenecks may be alleviated in some areas, but will just be replicated elsewhere in the network. Research shows that roadway expansion will not reduce the level of congestion overall. Therefore, the assertion that emissions per mile will drop is wrong.

The elasticity research presented above is supported by three other types of evidence:

1) There is a well-established theory which explains how freeway expansion fails to reduce congestion. In 1992 Anthony Downs coined the term *triple convergence* to describe how peak period traffic congestion is inevitable because drivers will compensate for capacity increases by (a) shifting routes, (b) shifting travel time of travel, and (c) shifting travel mode.[10] After capacity expansion, the new equilibrium will be just as congested as the old equilibrium.

2) Now that there is a huge amount of real-time traffic data from cell phones and toll transponders, it is possible to compare congestion levels in different regions. In a statistical analysis of congestion data across 74 U.S. regions compiled by INRIX, the amount of freeway capacity in a region was found to be unrelated to the amount of congestion.[11]

3) There are countless stories in every corner of the United States where freeway expansion has failed to provide promised congestion relief because of induced travel over the past 80 years. A few of these stories are shown in Figure 8. It is useful to observe that the stories are from news reports. The agencies that made the false claims generally appear to be uninterested in understanding why their claims were false. Instead, they continue to make false claims about the benefits of future projects.

[10] Downs, A. Stuck in Traffic: Coping with Peak-Hour Traffic Congestion. Washington DC: Brookings Institution, 1992.
[11] Marshall, Norman. L. A Statistical Model of Regional Traffic Congestion in the United States. Presented at the Annual Meeting of the Transportation Research Board, 2016. https://trid.trb.org/view.aspx?id=1392295

Figure 8: 80 Years of False Claims that Adding Freeway Capacity Can Eliminate Urban Freeway Congestion

San Jose 2004
When the bottleneck on Interstate 880 near Brokaw Road was unplugged two months ago with the addition of a third lane, traffic experts said it would shave 18 minutes off the afternoon southbound commute... Instead of saving time, commutes have lengthened by perhaps 18 minutes.

Seattle 2014
... five years and more than a billion dollars improving a stretch of the 405 freeway... one study suggests travel times have slowed a bit following all of the construction - by about a minute.

Chicago 2002
Rebuild of "Hillside Strangler" "commute time ... is one hour – exactly what it was before the Hillside Strangler was repaired"

Boston 2008
Big Dig and $15 billion.
The *Globe* documented no apparent overall travel time savings.

Denver 2000s
"As CDOT describes on its I-70 east Web page, new lanes on T-REX were congested within five years of construction. Almost $1 billion of new lanes brought little long-term benefit."

Washington 1990s
"Interstate 270 ... $200 million to widen more than a dozen miles, up to 12 lanes in some stretches.
... less than eight years after the project was finished, the highway has again been reduced to what one official called "a rolling parking

New York City 1936
Interborough and Laurelton Parkways: "By God it was as jammed as the Southern State ever was"

Houston 2016
The Katy Freeway is the wides freeway in the world with 26 lanes. Despite 2008 widening, "the 8th most congested roadway in the state"

Atlanta 1990s
"For years, Atlanta tried to ward off traffic problems by building more mile of highways per capita than any other urban area except Kansas City... As a result of the area's sprawl, Atlantans now drive ... more than residents of any other city."

Sources:
Atlanta: *USA Today,* November 4, 1997.
Boston: *Boston Globe*, November 16, 2008.
Chicago: *Daily Herald*, October 3, 2002.
Denver: *Denver Post*, June 22, 2015
Houston: Mayor Sylvester Turner, January 28, 2016.
New York City: Robert Caro, The Power Broker: Robert Moses and the Fall of New York, 1975.
San Jose: *San Jose Mercury*, January 23, 2004.
Seattle: Southern California Public Radio, October 10, 2014.
Washington: *Washington Post*, January 4, 1999.

The SANDAG 2015 *Regional Transportation Plan* includes $42 billion in roadway expansion projects. The SANDAG DEIR concluded that "the proposed Plan would not induce substantial vehicle travel."[12] This conclusion is based on SANDAG's travel demand model, and is inconsistent with real world data. This represents a test of the model, and the model failed.

If the model cannot properly account for induced travel, it cannot accurately forecast GHG emissions. In November 2017, the California Office of Planning and Research (OPR) published a *Technical Advisory on Evaluating Transportation Impacts in CEQA*. In strong contrast to the Caltrans silence on induced travel, this advisory recommends:

> *Whenever employing a travel demand model to assess induced vehicle travel, any limitation or known lack of sensitivity in the analysis that might cause substantial errors in the VMT estimate (for example, model insensitivity to one of the components of induced VMT described above) should be disclosed and characterized, and a description should be provided on how it could influence the analysis results. A discussion of the potential error or bias should be carried into analyses that rely on the VMT analysis, such as greenhouse gas emissions, air quality, energy, and noise.* [13]

OPR is to be commended for recognizing a severe deficiency in the regional transportation models, and recommending that these limitations should be disclosed and discussed. SANDAG should have included post-processing to account for induced travel using the 1.0 elasticity documented in the CARB Policy Brief.

In the eight years between the publication of SANDAG 2007 and 2015 RTPs, VMT decreased in most of the United States including the SANDAG region. SANDAG revised regional VMT forecasts downward. Figure 9 shows that the 2006 base year VMT in the 2007 RTP was higher than the 2010 base year VMT in the 2011 plan. The 2012 base year VMT in the 2015 RTP is even lower. The forecast VMT growth rate also has declined. The growth rate in the 2011 RTP was lower than in the 2007 RTP. The VMT growth rate in the 2015 RTP is lower still. Remarkably, the latest forecast for 2050 VMT is lower than what VMT would be today if the 2007 RTP were correct.

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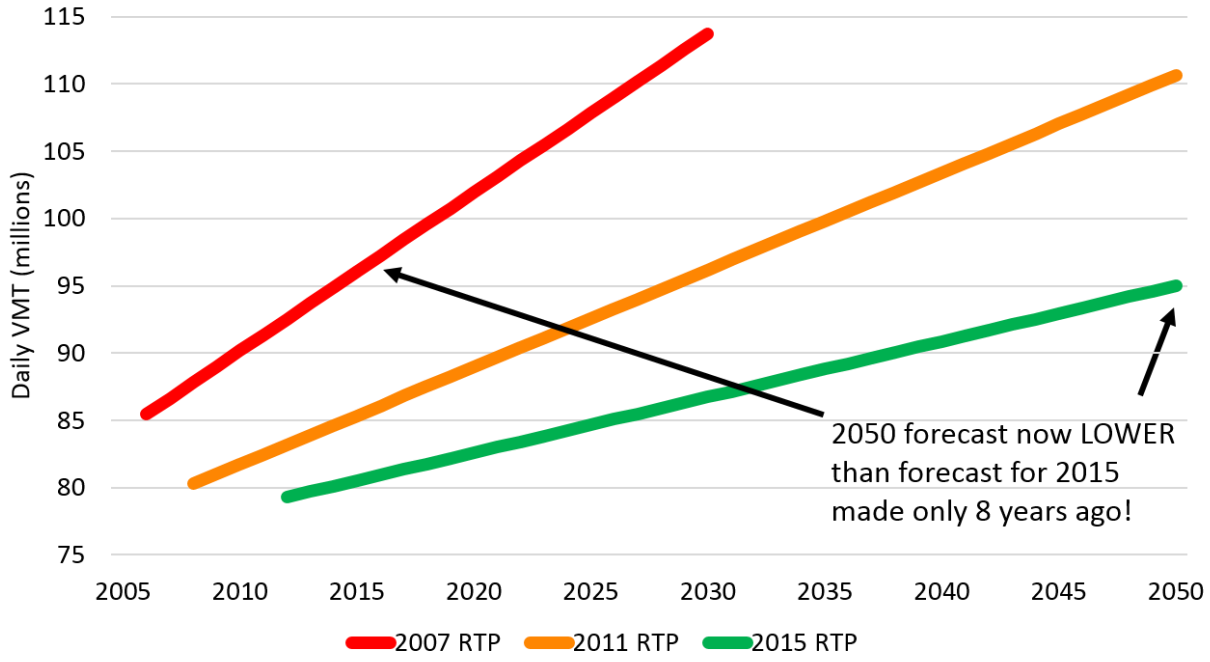
[12] SANDAG, Draft Environmental Impact Report San Diego Forward: The Regional Plan, p. 4.15-30, May 2015.
[13] California Office of Planning and Research. Technical Advisory on Evaluating Transportation Impacts in CEQA, p. 29, November 2017.
http://opr.ca.gov/docs/20171127_Transportation_Analysis_TA_Nov_2017.pdf

Figure 9: SANDAG VMT Forecasts in 2007, 2011 and 2015 Regional Transportation Plans[14]



The information in Figure 9 is mostly good news. However, since 2015, VMT growth has restarted and the region is not doing anything to stop this. Instead, it plans continued roadway expansion that will fuel additional growth in VMT and GHG emissions and encourage further sprawl, a vicious cycle.

The information in Figure 9 should have alerted SANDAG planners to consider a possible modeling problem between a questionable road expansion program in the 2015 RTP and transportation mode share forecasts in SANDAG's activity-based travel demand model. The SANDAG model is premised on past trip behavior, not future GHG reduction goals or land use and transit infrastructure changes. Instead of focusing on modeling deficiencies, SANDAG continued the very same roadway programs in the 2011 and 2015 RTPs (Figure 10). The only significant difference is that the projected costs of the program increased between 2011 and 2015. Except for two roadway projects completed between 2011 and 2015, [15] over 99% of the budget in the 2011 and 2015 RTPs is for the same projects. The primary difference is that the estimated cost for the group of projects in both RTPs has increased by 27% ($9 billion) between 2011 and 2015. [16]

How did the RTP propose to pay for the increased roadway construction costs? They did this by reducing planned capital spending on transit. All the roadway projects were kept, and it appears that the transit budget was developed by subtracting road funding from total funding; i.e. the money left over was

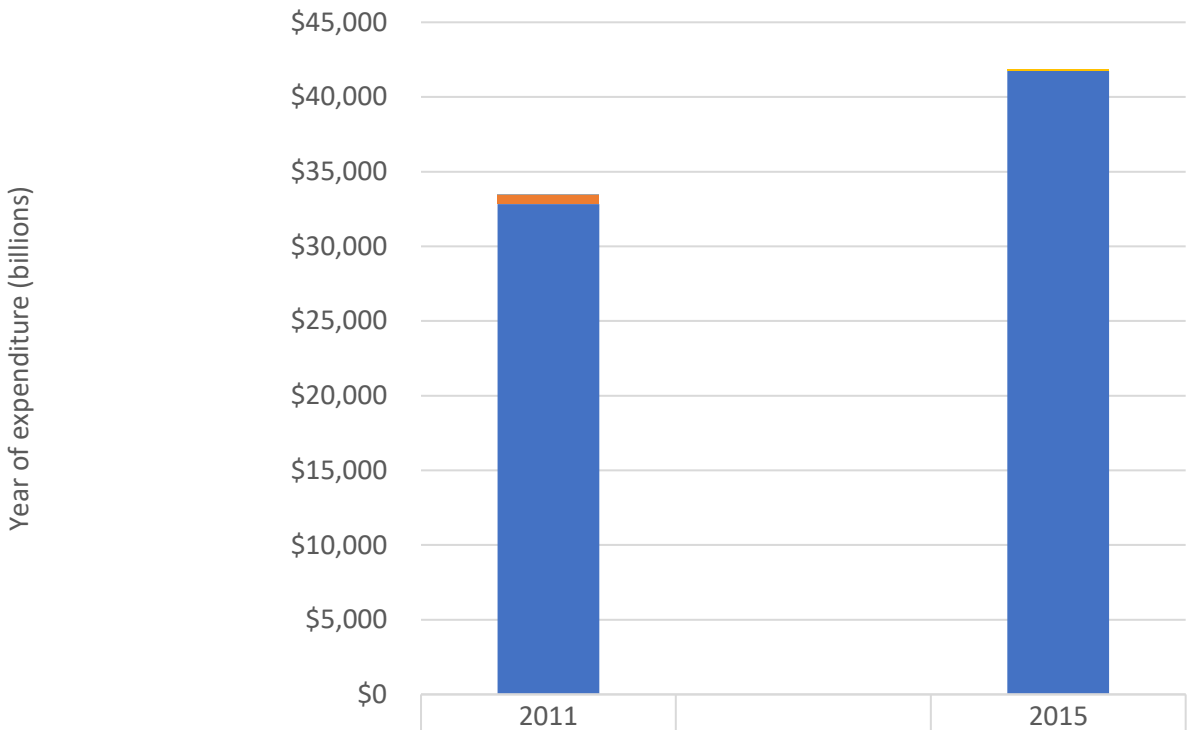
[14] 2007: *2030 San Diego Regional Transportation Plan: Final*, November 2007, Table 2.3, p. 2-7; 2011: *Our Region: Our Future: 2050 Regional Transportation Plan*, Table 2.2 p. 2-8 and Table 3.2, p. 3-8, October 2011; 2015: *Draft Environmental Impact Report San Diego Forward: The Regional Plan*, Table 4.15-7, p. 4.15-24, May 2015

[15] As shown in Appendix A, the completed projects are I-15 managed lanes projects: 1) from SR 163 to SR 56 and 2) from Centre City Parkway to SR 78.

[16] The spreadsheet where 27% ($9 billion) are calculated is shown in Appendix A with the project descriptions and costs taken from 2011 RTP Appendix A and 2015 DRTP Appendix A..

assumed to be available for transit Compared to the 2011 RTP, the road projects that are common to both plans have increased in estimated cost by 27% ($9 billion). Planned transit investment is decreased in the 2015 RTP relative to the adopted 2011 RTP.[17] This haphazard approach to transit budgeting is evidence that there has been little attempt to consider what it would take to build a complete high-functioning transit system in the region.

Figure 10: Comparison of Roadway Projects in 2011 and 2015 SANDAG RTPs



	2011		2015
Projects in 2015 Only			$118
Projects in 2011 Only	$47		
Projects Completed 2011-2015	$629		
Projects in Both RTPs	$32,835		$41,743

If the regional and County roadway expansion proceeds as planned, the failure of the SANDAG model to properly account for induced travel makes it likely that future VMT in the unincorporated area of the County is underestimated unless post-processing is done by SANDAG

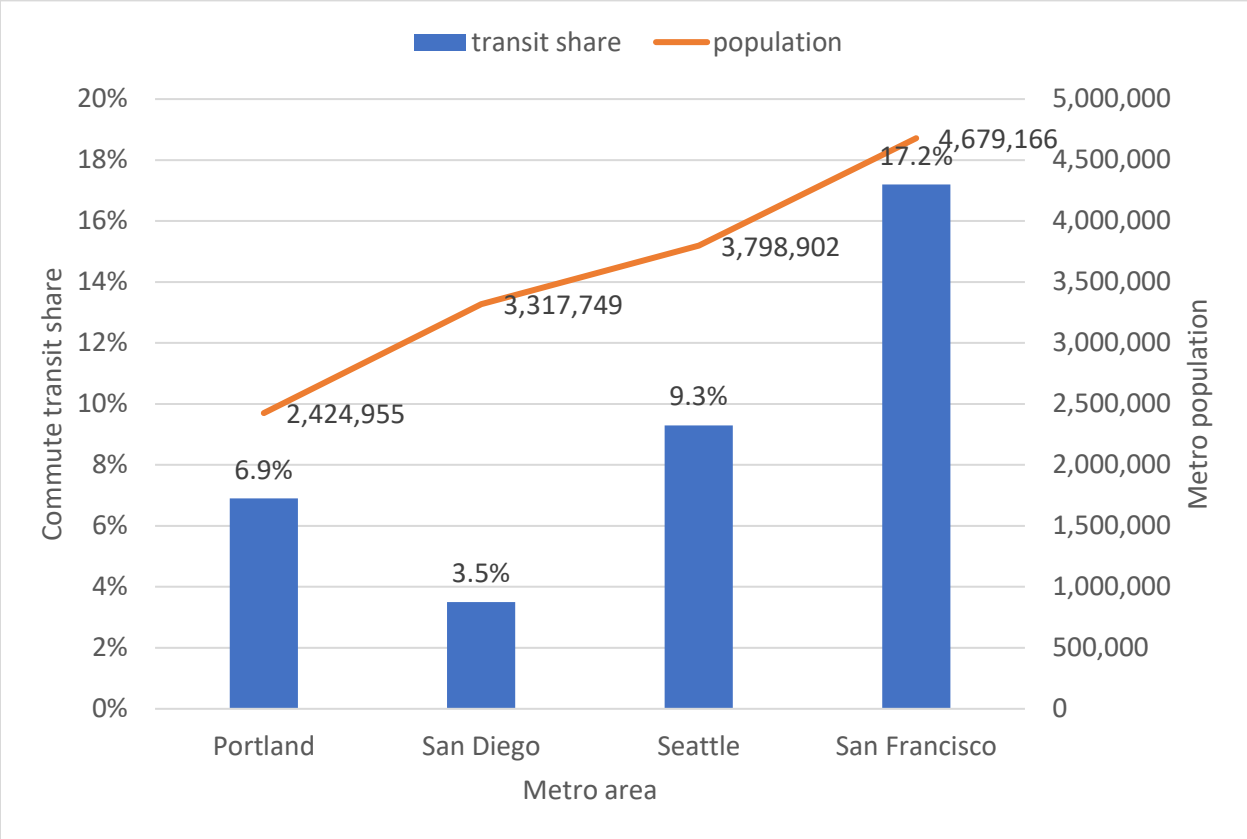
It is well known that the funding required to build the road program in the SANDAG 2015 RTP is not available.[18] An alternative should have been included in the CAP that included less expansion of County roads and regional roads.

[17] There are both additions and subtractions of specific transit projects between 2011 and 2015, but total planned investment is lower in the 2015 DRTP (2011 RTP Appendix A and 2015 DRTP Appendix A)..
[18] San Diego Tribune. Embattled SANDAG leader, Gary Gallegos, to step down by end of the year. August 8, 2017.

Failure to Include Transit in a Substantial Way

As shown in Figure 11, the San Diego region lags far behind other peer regions on the west coast in transit mode share. The data suggest that the San Diego region should at least double its transit share to be competitive with the peer regions. Furthermore, those peer regions are all working to expand their transit systems and to increase transit ridership.

Figure 11: Transit Work Mode Share in Four West Coast Regions



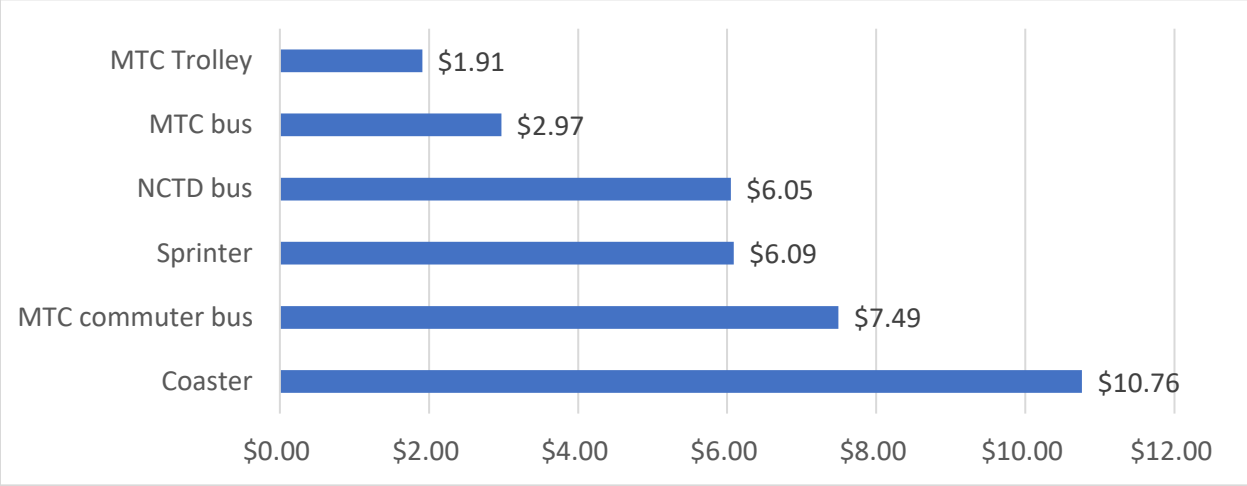
Notes: There is better data for work trips than other trips, and there is a strong correlation between transit work trip share and transit non-work share. 2015 transit mode share from https://usa.streetsblog.org/2016/09/16/where-car-commuting-is-shrinking-and-where-its-not/. Population from https://en.wikipedia.org/wiki/List_of_metropolitan_statistical_areas

Higher transit usage would translate into lower VMT and lower transportation GHG emissions – as a direct effect of moving people from cars to transit, and because regions with high transit usage also have high walk and bike share, especially for non-work trips.

CAP Strategy T-1.3 *Update Community Plans* is to: "*Focus growth in the county villages to achieve mixed- use, transit-oriented village centers by updating 10 community plans by 2030 and an additional 9 community plans between 2031 and 2040*." (CAP, p. 3-14) While expanding transit is the region is critical, there is likely little transit potential in most of the unincorporated area and focusing scarce transit resources in such areas is likely counterproductive.

Figure 12 shows 2016 transit operating costs per passenger trip in San Diego region for its two larger transit providers: San Diego Metropolitan Transit System (MTS) and North County Transit District (NCTD).

Figure 12: Operating Expenses per Passenger Trip[19]



As shown in Figure 12, the MTC Trolley and MTC bus services are much more economically efficient than the transit that serves lower density parts of the region. Attempting to expand transit to outlying areas that are not currently served would be even more expensive – due to a combination of long distances and low ridership.

The Urban Area Transit Strategy (UATS) completed for SANDAG in 2010 states:

> *The overarching goal of the UATS was to create a world-class transit system for the San Diego region in 2050, with the aim of significantly increasing the attractiveness of transit, walking, and biking in the most urbanized areas of the region.*
>
> *The vision called for a network of fast, flexible, reliable, safe, and convenient transit services that connect our homes to the region's major employment centers and destinations. Achievement of this vision would make transit a more appealing option for many trips, reducing the impact of vehicular travel on the environment and on public health. Other key goals included:*
>
> - *Making transit more time-competitive with automobile travel;*
> - *Maximizing the role of transit within the broader transportation system; and*
> - *Reducing vehicle miles traveled and greenhouse gas emissions in the region. (p. TA 7-5)*[20]

The UATS shows a high potential for transit ridership in the region's urban core (Figure 13).

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[19] Federal Transit Administration. 2016 National Transit Profiles.
[20] SANDAG. Urban Area Transit Study.
http://www.sandag.org/index.asp?projectid=368&fuseaction=projects.detail

Figure 13: SANDAG Urban Area Transit Study Figure TA 7.8

Figure TA 7.8

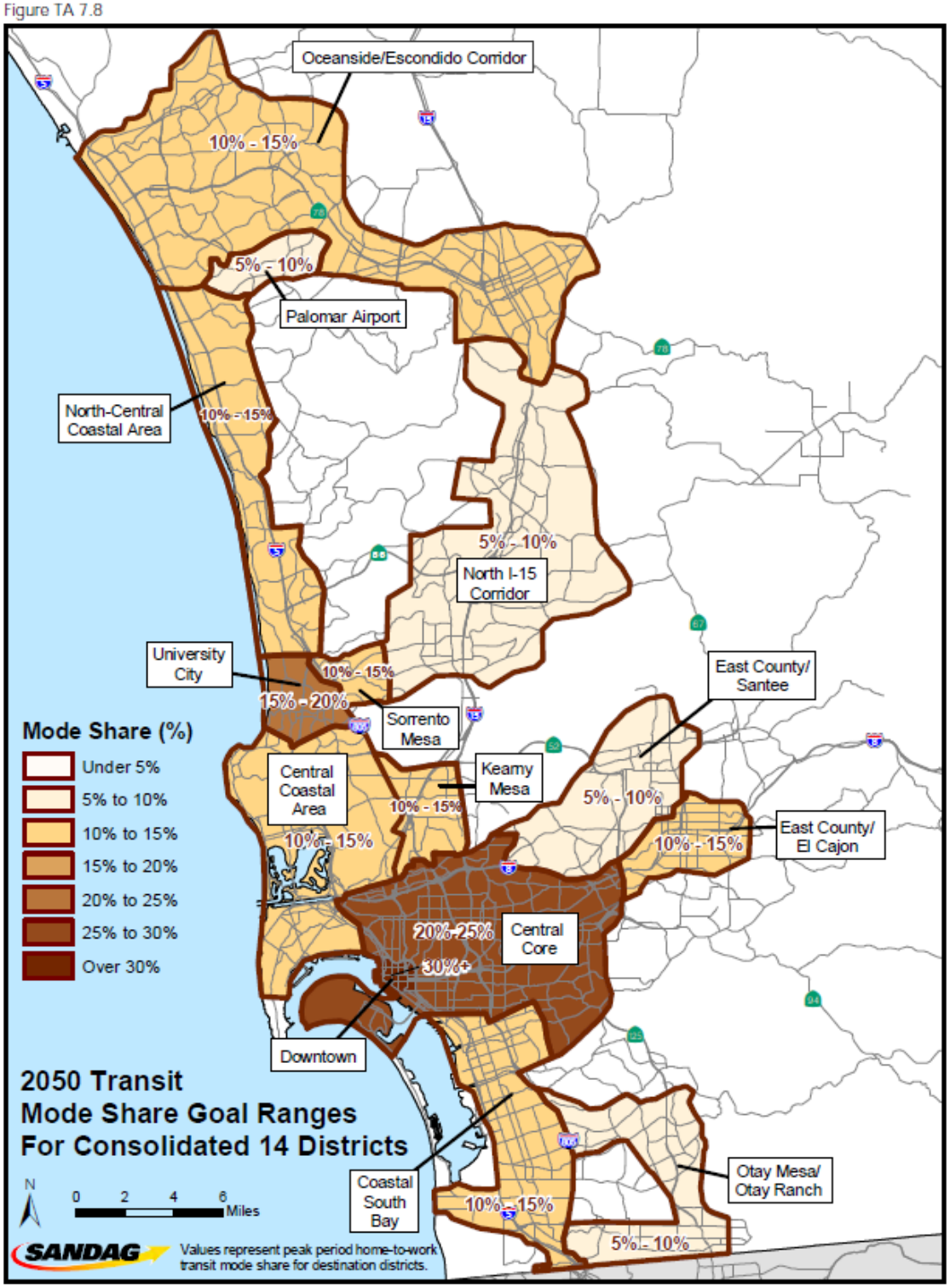
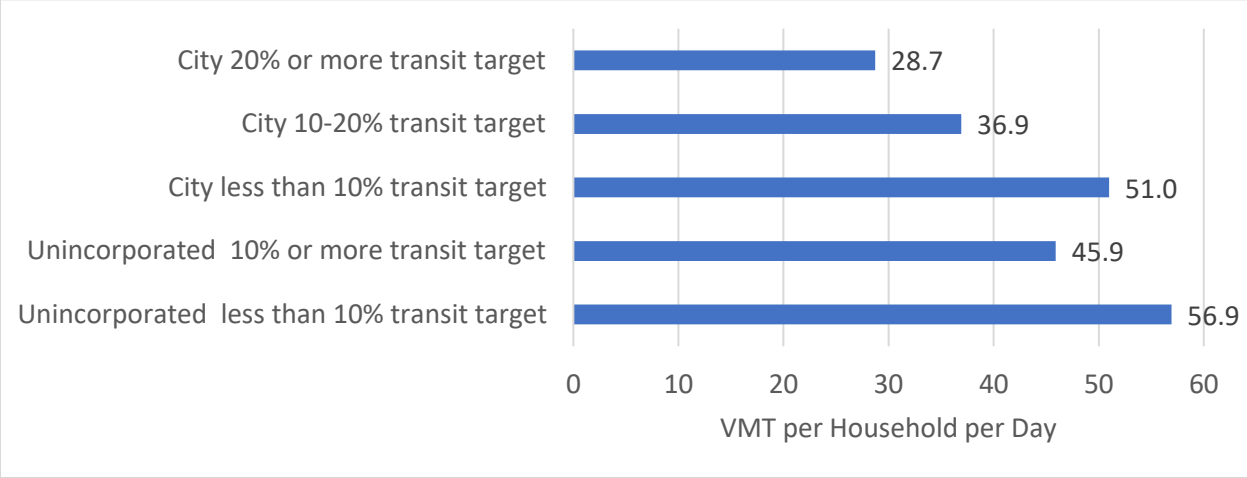


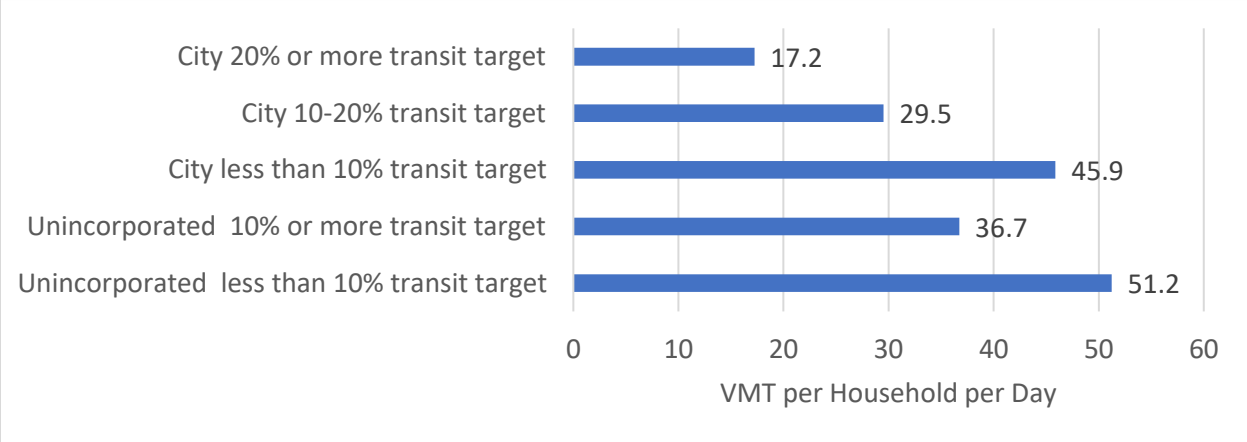
Figure 5 showed that, on average, households in the unincorporated area produce 29% more VMT than households in the County's 18 cities. The differences are even more pronounced it the region is segmented also by the UATS areas (Figure 14).

Figure 14: Average Household VMT per Day by Jurisdiction and UATS Group (CHTS)



As shown in Figure 14, households in the areas of the region with the greatest transit potential average only half as much VMT today as the areas with the least transit potential, i.e. most of the unincorporated portion of the County. Furthermore, these numbers are for the current condition with a relatively poor transit system. The City of San Diego should be the top priority for improved service because it has set a 2035 target of 25 percent transit mode share, 18% walk mode share, and 7% bike mode share (50% total) for Transit Priority Areas (within a half mile of a major transit).[21] If the City's and the UATS transit goals were achieved, the VMT numbers in Figure 14 would shift down considerably in the transit-priority areas (Figure 15). The range from areas with the most transit potential to the least increases to a factor of 3. If sprawl is constructed, the higher VMT resulting will be a permanent condition that cannot be mitigated.

Figure 15: Estimated Average Household VMT per Day with Transit Targets Met



[21] City of San Diego. Climate Action Plan, 2016. https://www.sandiego.gov/sites/default/files/final_july_2016_cap.pdf

Inadequate Set of Alternatives

The CAP Environmental Impact Report (EIR) identifies the following alternatives:

- No Project Alternative
- Enhanced Direct Investment Program Alternative
- 100 Percent Renewable Alternative
- Increased Solid Waste Diversion Alternative (CAP EIR, p. 4-5)

The largest proportion of County GHG emissions in 2014, 45%, are generated from on-road transportation. (CAP Table 2.1 p. 2-6) None of the EIR alternatives address this sector at all. As discussed above, the County has substantial control over development and roadway construction that both will have an enormous impact on future GHG. Different assumptions about development and roadway construction should have been included in the alternatives.

Better Alternative

Two better alternatives should have been included in the CAP:

1) The 50-10 Transit Plan
2) The land use elements of the 50-10 Transit Plan (without the regional transit system)

In 2011, the Cleveland National Forest Foundation proposed t*he 50-10 Transit Plan: A World Class Transit System for the San Diego Region*. This plan stated:

> … the 50-10 Transit Plan would initiate a transformation in the region's transportation system and land use patterns. The premise of the Plan is quite simple: fifty years of transit improvements would be implemented over the next decade. This comprehensive, integrated transit system initially would be constructed within the region's urban core, while also including the Sprinter and the Coaster. At the same time, the Plan calls for halting any new freeway and/or tollway construction until the transit system is fully functional. An equally critical element of the Plan calls for a modification of the T*ransNet* program to re-prioritize transit over highway projects…
>
> The benefits of the 50-10 Transit Plan … include: shorter automobile trips on average, reduction in transportation costs and traffic congestion, more housing and transportation choices, many more walk and bicycle trips, and improved public health and overall quality of life.

Shifting the regional investments from roadway expansion to transit would reduce future GHG emissions both by eliminating induced travel and by getting people out of their cars and onboard transit. These direct impacts are supplemented by land use impacts. Eliminating roadway expansion discourages sprawl, even without a strong regulatory deterrent. Building transit encourages compact development.

Table 1 shows a sketch analysis that illustrates how the implementing the 50-10 Transit Plan could meet the 2030 target without the offset program. In addition to meeting the 2030 target without the offset program, the 50-10 Plan also would put the County in a much better position in achieving the 2050 goal.

Table 1: Sketch Analysis of 50-10 Transit Plan in 2030 (Metric Tons of CO_2e)

	2014	2030 CAP	2030 50-10 Transit Plan	50-10 Transit Plan Notes
Existing land use	1,456,060	940,342	836,904	VMT down 11% due to shift in investments from roads to transit
New land use		140,881	62,692	50% of CAP housing growth
Mitigation		(53,382)	(53,382)	
Offsets		(175,640)		not necessary
Total GHG	1,456,060	852,201	846,214	
Relative to 2030 Target		0	(5,987)	below 2030 target

California's 2050 GHG reduction target is very ambitious. As discussed above, if the CAP had tried to use the same trick in 2050 of closing the gap only with offsets, the required offsets would have been 715,000 Metric Tons of CO_2e, over 4 times the amount assumed in 2030, and much more than is feasible. Relying on offsets leads to a dead end. If the sketch analysis of the 50-10 Transit Plan is extended to 2050 using the same assumptions as shown in Table 1 the 2050 gap would be reduced by one third. The other two thirds will require some combination of technological advances and behavior changes.

The full benefits of the 50-10 Transit Plan require shifting regional transportation investments from roadways to transit. However, as is documented above, huge GHG reductions can be achieved through the land use shifts alone. Therefore, an alternative with these land use shifts alone should have been included in the CAP.