



**METROPOLITAN'S UNCERTAIN  
FUTURE WATER DEMAND:  
WHAT THE EXPERTS SAID**

As Metropolitan updates its long-term water strategy, its Integrated Resources Plan (IRP), the District is looking at a range of futures given all the uncertainties California faces when it comes to water. In this ongoing scenario planning process, Metropolitan is examining key uncertainties – being referred to as drivers – that will shape the future.

Southern California's future population growth, housing mix and economy are drivers that will have considerable influence on future demands on Metropolitan supplies. To better understand these drivers, Metropolitan enlisted the feedback of experts in water planning and demography to help the Board of Directors, our 26 Member Agencies and staff to advance the IRP process.

On March 23, 2021 Metropolitan held a three-hour workshop for these experts to engage with Board members and water managers to share insights on key influences of future water demands in Southern California. While climate change was mentioned, a separate workshop specifically dedicated to uncertainties related to climate change is scheduled for May 25, 2021.

The following are highlights of how these experts answered key questions on the drivers and their effects on future demand. [Here](#) is a video link to the full workshop.

Drivers: What are the most important underlying drivers that influence demands? How do they affect demands in each of the three major demand sectors: single family residential, multi-family residential and commercial/industrial?



## Lisa Maddaus

- Co-owner and senior water resources engineer with Maddaus Water Management Inc.
- B.S. and M.S. in Civil and Environmental Engineering from UC Davis

## Principal Drivers



“ As we look to the future, we need to think about: **What do new housing types look like? How are household uses changing? How are the existing households changing over in their water use? How are businesses using their water?** ...There is a lot happening as these gears (drivers) turn. The question is how much are they accelerating? How much is the growth going to continue and at what pace? ”

## Key Points

- Three quarters of current Municipal & Industrial demand is residential (single and multifamily). This will shift slightly in the future but not dramatically.
- Population, population growth, and demographics drive a lot of demand.
- There is a lot of complexity with other drivers happening in the background, including weather, climate, price of water, affluence and income, compliance with landscape ordinances, and temporary “shock” drivers. The effects may be interrelated, but relationships may not be linear.

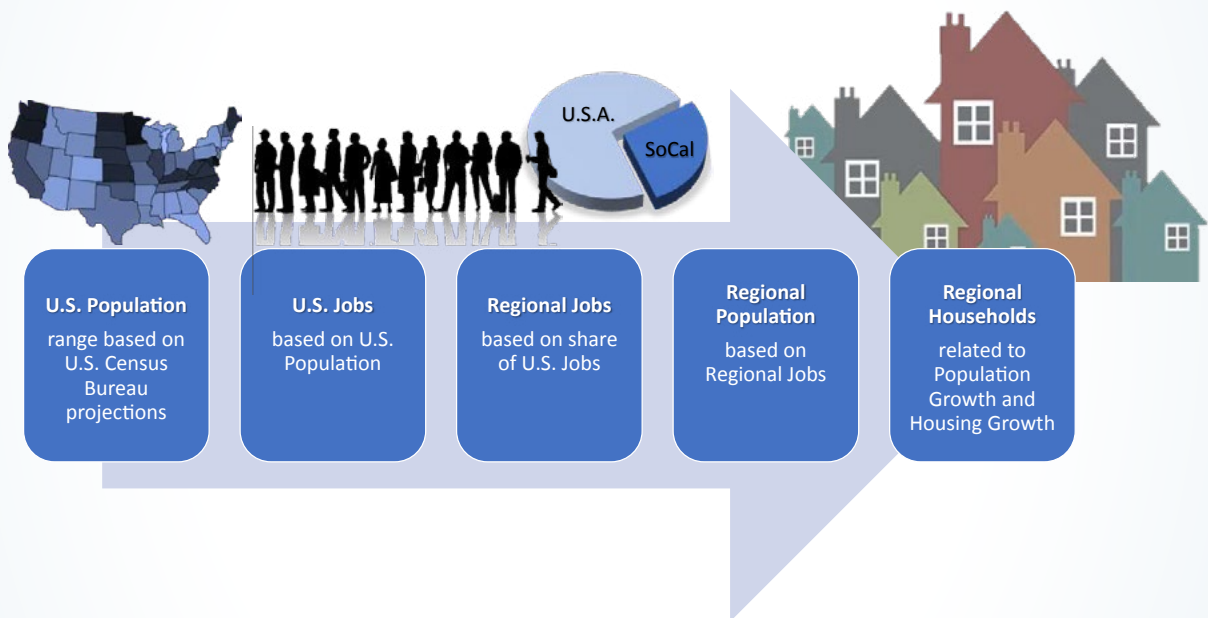
# Demographics: How do we account for uncertainties in future demographic factors and how can they be measured?



## Stephen Levy

- Director and Senior Economist of the Center for Continuing Study of the California Economy in Palo Alto
- Degrees in economics from MIT and Stanford University

## Framework for Demographic Projections



“ *Even with the high forecast, we are looking at rates of growth that are low...We are going to move into a period of either very slow growth, if immigration is restricted, or relatively slow growth. We’re looking at growth rates of under 1% a year.* ”

## Key Points

- Three main inputs from the national forecast are total population, total level of jobs, and importantly, the composition of jobs. The three main drivers for the region are immigration, competitiveness, and housing.
- The major uncertainty in U.S. growth is the future of immigration. With birth rates falling and death rates rising, immigration will be the key to how fast the country grows. Last year, the U.S. Census Bureau projected that the U.S. population would grow from its 2019 population by between 36 million and 79 million by 2045.
- The region’s economy is resilient, fluctuating in a narrow range between 6 and 7% of US jobs over the past three decades.
- The composition of U.S. job growth is slightly favorable to the region with a focus on trade, tourism, technology, and creativity.
- Affordability, expanding housing supply, and investment in infrastructure are major drivers as to how the region will capture job growth.

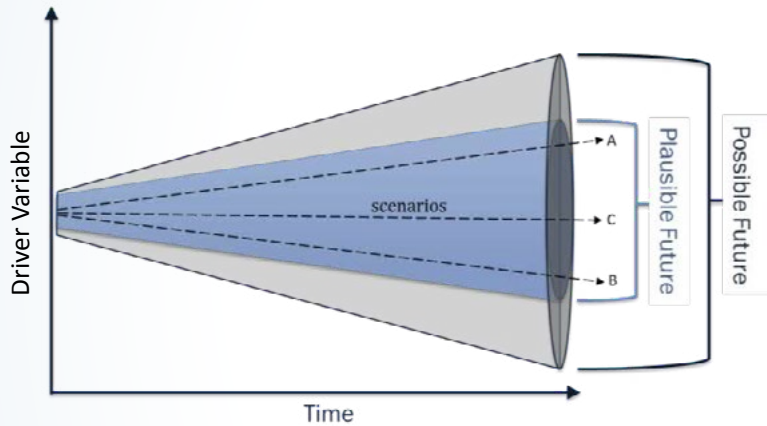
Ranges: Given what is known about these drivers, provide guidance on estimating a plausible range of future outcomes for each driver and why.



## Dan Rodrigo

- Senior Vice President and Global One Water Practice Leader for CDM Smith
- BS in Economics and MS in Environmental Planning from Southern Illinois University, Carbondale

## Forecasting Drivers



- Plausible range includes things that are likely to occur but with considerable variability into the future.
- Possible range includes things that could happen, although we haven't seen evidence of it just yet. Black Swan Events\* often fall in this range.

\* A black swan is an unpredictable event that is beyond what is normally expected with potentially severe consequences. They are characterized by their extreme rarity, severe impact, and the widespread insistence they were obvious in hindsight.

“ ***New homes are based on plumbing codes and the model water efficient landscape ordinance. Indoor water use is roughly at or below 50 gallons per capita per day and outdoor is probably along the range of 20 to 50 GPCD. It's a good idea that Met may look at splitting the forecast between existing and new homes. That might be an improvement in the way to forecast residential demands.*** ”

## Key Points

- Demand forecasting is a mixture of art and science. Professional judgment with insights goes a long way.
- A good water demand forecast has robust statistical models, defensible projections of driver variables, back casting accuracy.
- For the IRP scenarios, we are focused on the plausible range, where things are likely to occur but with considerable variability in the future.
- While Southern California Association of Governments and Southern California Association of Governments forecast single and multifamily housing, they don't provide information on housing characteristics like density. Other sources can provide guidance such as General Plans, historical trends, building permits and professional judgment.
- Internal consistency is important when combining drivers in scenarios.

Methodologies: Given what is known about these drivers, provide guidance on approaches or methodologies to measure and quantify the effect of the drivers on demands, in each of the three major demand sectors.



## Dr. Thomas Chesnutt

- CEO of A & N Technical Services, Inc.
- Ph.D. and M.Phil. in Policy Analysis from the RAND Graduate School, M.S. in Technology and Science Policy from the Georgia Institute of Technology and B.A. in Economics from Kenyon College

### Hot Takes on Demand Driver Effects

#### CLIMATE CHANGE → WEATHER → WATER SUPPLY AND DEMAND, DIFFERENTLY

- Average Precipitation May Be The Same, Pattern Differs→ Bigger Effect on Supply
- Increase In Mean Temperature→ Large Effect on Future Demand via Outdoor Water Use
- Increase In Weather Variability→ Predictable Increase in Drought Likelihood and Duration

#### HIGH POPULATION GROWTH SCENARIOS

- Effect On Demand Dampened By ADU's, Densification, And Landscape Transformation

#### LOW GAP SCENARIOS

- Slower Adaptation

#### INTERVENTIONS CAN CHANGE THE EFFECT OF DRIVERS ON DEMAND

- Example: Customer Engagement/Information Can Change Response To Price

“ *Average precipitation under climate change could be the same but the pattern could be very different. If you have more precipitation arriving as rain instead of snow, that really has a huge effect on supply because the amount of snow stores water from the winter to when you need it in the summer. The big effect on demand may occur more through the driver of temperature. There would be a large effect on future demand via outdoor water use. There would actually be an increase in demand for what customers would be willing to pay for water under some of these scenarios. ...There is also a direct effect of climate change in increasing variability, which leads to a predictable increase in drought likelihood and duration, which in turn increases the value of the water service we are all interested in providing.* ”

### Key Points

- There are a range of methods for estimating the effects of demand drivers, including professional judgment (different kinds of end uses and prevalence), multiple variable (econometric), and a combination. The estimation method should depend on the measures available (wholesale and retail).
- There are long-term demand drivers (population and employment growth, regulations, climate change), mid-term drivers (densification, and shock drivers (weather variation, recession).
- There is risk for both high and low demand with each driver. Some uncertainties can be reduced by measurement.
- Interventions can change the effect of drivers on demand. Interrelationships between drivers and effects cannot be assumed away. There are standards for how to combine uncertainties.

Interrelations: What are any major interrelations between ranges and direction of future outcomes for these drivers? Provide guidance on how to treat these drivers in an internally consistent fashion within the IRP scenarios.

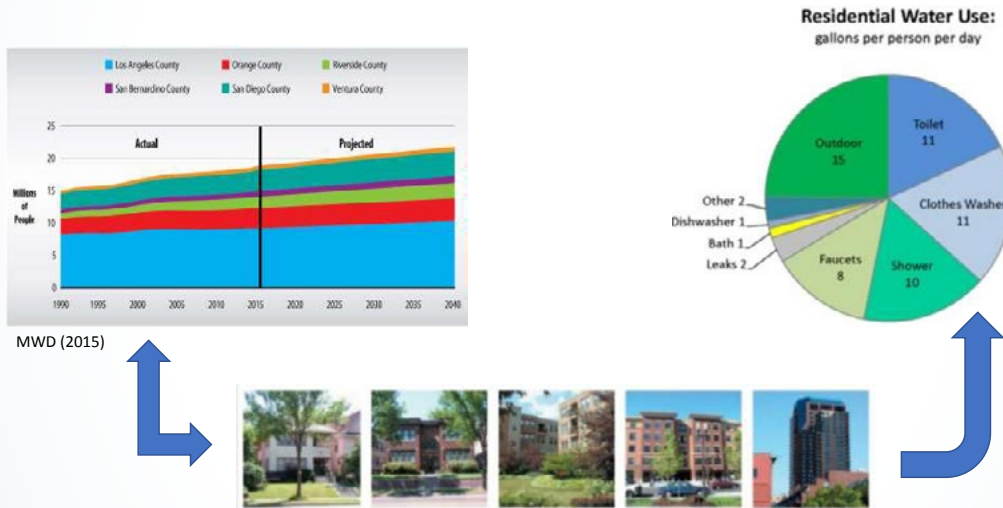


### Dr. Kurt Schwabe

- Expert on economic issues and water use, agricultural production, urban water conservation, ecosystem services, and environmental regulation
- B.A. in Mathematics and Economics at Macalester College, M.S. in Economics at Duke, and Ph.D. in Economics from N. Carolina State

## Demand Assumption Refinements- Interrelations

Issue 1: When developing models to predict future water demand, need to ensure that the assumptions that comprise individual drivers of demand are consistently applied



“ *In the ‘80s and the ‘90s we used to look at population growth and holding GPCD constant as a measure of water demand forecasting. That is long gone because of the complexities and the heterogeneity that you confront with regard to how people use water, how it is related to drivers and what the assumptions of those drivers depend upon.* ”

### Key Points

- Assumptions for individual drivers of demand must be consistently applied. For example, assumptions for population growth should be consistent with assumptions for drivers of individual water demand.
- Understanding interrelations across drivers can help avoid over-estimating water savings.
- The accuracy of model predictions depends on how well the data and contexts used to generate the model parameters represent future conditions and contexts.