H-GAC VisionEval Proposed Scenario List

June 26, 2023

**Summary of proposed scenarios**

Ten categories of scenarios are proposed for H-GAC 8-County transportation management area, which currently consists of 8 Azones (Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery and Waller County) and 5217 Bzones with a base year of 2019 and a forecast year of 2045. The scenarios are summarized in Table 1, detailed on the pages that follow, and reflect the following topics of interest to H-GAC.

1. Unexpected development patterns at the TAZ level.

1a. Unexpected hurricane or storm water damage causes reduced population in certain Bzones.

1b. New employment centers emerge and alter employment growth allocations.

1c. Both households and employment changes occur simultaneously.

1. Changes in regional growth at selected city/county or employment sub-centers.

2a. Change population growth in certain county/city so that they are above/below current forecast level.

2b. Change employment growth in selected employment centers.

2c. Both population and employment changes occur at the same time.

1. Increased telecommuting.
2. Changes in household size.
3. Changes in tax policy for transit or highway travel.

5a. Increase fuel tax on vehicle.

5b. Keep scenario 5a but now attain the same tax for electric vehicles.

5c. Retain scenarios 5a and 5b, calculate the increase in transit supply that could be provided by this tax increase, and increase transit supply accordingly.

5d. Same as 5c except don’t divert funds to transit.

1. Increases in transit or freeway supply.

6a. Increases in transit density.

6b. Increases in freeway lane miles.

1. Reductions or increases in fuel costs (highway, transit).
2. Availability of subscription-based autonomous vehicles.
3. Changes in the pedestrian environment in select locations.
4. Electrify transit and highway vehicles.

10a. To simulate electrification of subscription-based autonomous vehicles.

10b. Increase the proportion of hybrid buses and paratransit vans.

10c. To simulation electrification of household vehicles.

10d. Increase the proportion of hybrid heavy trucks.

Each scenario in Table 1 below reflects one of two types of changes: a policy change enacted by decision makers or an unanticipated change wrought by external events beyond the control of the decision maker (a key theme noted in the one-minute elevator speeches of the VisionEval Summit held in March). For instance, population and employment forecasts may differ from what is expected (scenario categories 1 and 2): while such changes may be related to actions taken by decision makers (school quality, immigration, tax policies), such changes are generally beyond decision makers’ control. By contrast, decision makers may choose to increase or reduce transportation investments. Both types of changes—those made by decision makers and those beyond their control—are shown in Table 1.

**Table 1. Summary of Scenarios with the Houston-Galveston Area Council**

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| **No** | **Changes from Base Case** | **Input Files** | **Variables of Interest** | **Comments** |
| 0 | None. |  |  |  |
| 1a. Unexpected development patterns at the TAZ level | Unexpected hurricane or storm water damage reduces population density in hurricane evacuation areas.  Keep all Azone households constant. For Bzones, change household allocation (bzone\_dwelling\_units.csv). Reduce housing units in old neighborhood of Galveston Island (East of Offats Bayou Cross Rd) Bzones by 20%, and relocate reduced dwelling units (2797 SFDU, 843 MFDU, and 34 GQDU) to other Bzones along FM 517 (South of SH99, east of I-45 and north of SH 6) within Galveston County. Relocated additional GQ population to Bzone 4663 only. | bzone\_dwelling\_units.csv | SFDU, MFDU, GQDU | Based on H-GAC’s Hurricane Evacuation map, reduce 20% of purple zone households in Galveston Island to relocate to upper northwest of Galveston County area. |
| 1b. Unexpected development patterns at the TAZ level | New employment centers emerge and alter employment growth allocations. Added new employment centers, Conroe, Sugar Land, and Rosenberg, to existing employment centers list. Increase employment in Conroe and Rosenberg center by 15%, and Sugar Land center by 5%. The 2045 base regional total employment is 4,701,843. Additional increased employment in new centers is 15,878. It accounts for 0.3% of total employment. | bzone\_employment.csv | TotEmp. TotRet, TotServ | The total employment in centers accounts for 32% of regional employment for the base model. |
| 1c. Unexpected development patterns at the TAZ level | Both households and employment changes occur simultaneously.  Combine scenarios 1a and 1b such that both changes in place. | bzone\_dwelling\_units.csv, bzone\_employment.csv |  | No need for bzone level data modification. |
| 2a. Increase the households and group quarters population | Change population growth in certain county/city so that they are above/below current forecast level.  Increase the household population and group quarters population by 15% for certain Azone (Waller, Liberty) levels and then increase the number of households by 5% at the Bzone level for the same Azone (Waller and Liberty). Do this for the year 2045 only. | azone\_hh\_pop\_by\_age.csv  azone\_gq\_pop\_by\_age.csv  bzone\_dwelling\_units.csv  bzone\_employment.csv |  |  |
| 2b. Increase the employment by 10% at the Bzone level (there is no corresponding Azone employment) for corresponding Azone from 2a. Stored in Folder 2b. | Change employment in selected 2a Azone.  Increase the employment by 10% at the Bzone level (there is no corresponding Azone employment) for corresponding Azone (Liberty and Chambers County) from 2a. Do this for the year 2045 only. | TotEmp |  |
| 2c. Combine scenarios 2a and 2b. | Both population and employment changes occur at the same time.  Combine scenarios 2a and 2b. Again, no separate folder required. |  |  |
| 3. Increased telecommuting | Reflect a very small (1.25%) increase in telecommuting by increasing EcoProp in bzone\_travel\_demand\_mgt.csv (This 1.25% is the maximum value we can achieve in this manner). Why? Increasing EcoProp in Employment Centers bzone by 20% for CBD, Greenway Plaza and Energy Corridor. And increasing by 10% for the rest of bzone in Employment Centers. | bzone\_travel\_demand\_mgt.csv | EcoProp | VDOT tested 3 methods for telework but preferred this method. Why? |
| 4a. Changes in household size | Alter the number of one-person households (Prop1PerHh) and the average household size (AveHhSize) in azone\_hhsize\_targets.csv) to simulate larger and smaller families. Reduce the proportion of 1-person households by 10%, increase the average household size by 10%. Do it for year 2045 only.  Also alter the number of children in azone\_hh\_pop\_by\_age.csv (Age0to14 and Age15to19). Increase the number of children in group “Age0to14” and “Age15to19” by 10% each. Do it for year 2045 only. | azone\_hhsize\_targets.csv  azone\_hh\_pop\_by\_age.csv | Prop1PerHh  AveHhSize  Age0to14  Age15to19 |  |
| 4b. Changes in household size | Make no changes except explicitly allow aging in place (relative to the base scenario) by increasing the Age65Plus attribute (in *azone\_hh\_pop\_by\_age.csv*) and increasing the proportion of 1-person households in the file *azone\_hhsize\_targets.csv*. Presumably seniors who live in institutionalized group quarters (not reflected in VE) now arrive to households. Increase “Age65Plus” in azone\_hh\_pop\_by\_age.csv by 10%. And increase the proportion of 1-person households in file “azone\_hhsize\_targets.csv” by 10%. Do it for year 2045 only. | *azone\_hh\_pop\_by\_age.csv*  *azone\_hhsize\_targets.csv* | Age65Plus |  |
| 5a. Changes in tax policy for transit or highway travel | Increase the fuel tax on vehicles (that use gasoline) in azone\_veh\_use\_taxes.csv | azone\_veh\_use\_taxes.csv  mare\_transit\_service.csv | VehOwnFlatRateFee.2015  VehOwnAdValoremTax |  |
| 5b. Changes in tax policy for transit or highway travel | Keep scenario 5a but now attain the same tax for electric vehicles (plug-in hybrid?) |  |  |
| 5c. Changes in tax policy for transit or highway travel | Retain scenarios 5a and 5b, calculate the increase in transit supply that could be provided by this tax increase, and increase transit supply accordingly. |  |  |
| 5d. Changes in tax policy for transit or highway travel | Same as 5c except don’t divert funds to transit. |  |  |
| 6a. Increases in transit or freeway supply | Increase in transit density. Increase D4c (Aggregate frequency of transit service within 0.25 miles of block group boundary per hour during evening peak period) for EJ zones by 20%. | bzone\_transit\_service.csv |  | EJ data is from 2019 ACS. |
| 6b. Increases in transit service.  6c. Increase in freeway supply. | Increase various transit service by type (demand response, standard bus, commuter rail, etc.) revenue miles  Increases in freeway lane miles. Increase roadway supply miles. Unfortunately it seems we can only do this at the Marea level—not the Azone or Bzone level. (See FwyLaneMi within marea\_lane\_miles.csv). Do this for arterials, then freeways | mare\_transit\_service.csv  marea\_lane\_miles.csv | FwyLaneMi |  |
| 7a. Reductions or increases in fuel costs (highway, transit) | Alter FuelCost and PowerCost in azone\_fuel\_power\_cost.csv; this affects both gas-powered vehicles and electric vehicles. | azone\_fuel\_power\_cost.csv  azone\_hh\_veh\_own\_taxes.csv | FuelCost  PowerCost |  |
| 7b. Reductions or increases in fuel costs (highway, transit) | Alter the cost of vehicle ownership (can only do this at the Azone level) as part of azone\_hh\_veh\_own\_taxes.csv. | VehOwnAdValoremTax |  |
| 8a | For select Bzones, alter car service level from low to high (see bzone\_carsvc\_availability.csv) which means high availability of any of the following: carsharing (e.g., Zipcar), taxi (e.g., Lyft), and “future automated taxi services” (presumably CAV on demand as a subscription). Perhaps do this in Bzones with interstates to reflect staged arrival of autonomous vehicles. |  |  | There is ongoing work to create an AV module. HGAC should not start this work until AV module is finalized |
| 8b | Repeat scenario 8a but increase car service level to high for all Bzones. |  |  |
| 9a | In the subset of Bzones, alter the 2045 values of D3bp04 to increase the density of pedestrian friendly intersections in selected locations. |  |  |  |
| 9b | Repeat the increases of 9a in some other location of the region. |  |  |
| 10a | To simulate electrification of subscription-based autonomous vehicles, within region\_carsvc\_powertrain\_prop.csv increase the proportion of hybrid cars and light trucks (CarSvcAutoPropHev and CarSvcLtTrkPropHev). |  |  |  |
| 10b | Within marea\_transit\_powertrain\_prop.csv, increase the proportion of hybrid buses and paratransit vans (BusPropHev and VanPropHev). |  |  |
| 10c | To simulation electrification of household vehicles generally, based on  https://www.eia.gov/environment/emissions/co2\_vol\_mass.php, bring in region\_ave\_fuel\_carbon\_intensity.csv and modify the HhFuelCI attribute—that’s really the only way to alter powertrain for household vehicles. |  |  |
| 10d | Within region\_hvytrk\_powertrain\_prop.csv, increase the proportion of hybrid heavy trucks (HvyTrkPropHev). [My guess now is ComSvcAutoPropHev and ComSvcLtTrkPropHev are household-based industrial services such as a plumber, roofer, or electrician—not a heavy vehicle but not a passenger car either.] |  |  |
| 10e | To reflect changes in electricity supply (e.g., solar, coal, etc.) alter within azone\_electricity\_carbon\_intensity.csv the attribute ElectricityCI which is “Carbon intensity of electricity at point of consumption.” |  |  |  |

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| 11a. Increase transit supply | US 90 W study, increase D4c by 50% for TAZs within study area. | bzone\_transit\_service.csv |  |  |

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| 11b. Increase worker telework/carpool/transit participation rate | For TAZs within US 90 W study area, increase worker telework/carpool/transit participation rate from zero to 35% | bzone\_travel\_demand\_mgt.csv |  |  |

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| 11c. Combine transit supply and employee travel demand management | Combine 11a and 11b as one scenario. | bzone\_transit\_service.csv  bzone\_travel\_demand\_mgt.csv |  |  |