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Emissions Inventory Considerations for Supporting the Development of State & Local Climate Change Mitigation Plans

15th Annual International Emissions Inventory Conference

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Select Climate Change Mitigation Goals

State/ Area	1990-2020 Forecast	Goal (CO_2e Reductions)	2010-2020 Result
AZ	**118-147%**	**TBD**	**TBD**
CA	34%	2000 by 2010; 10% below by 2020; 75% by 2050	TBD
CT	32%	1990 by 2010; 10% below by 2020; 75% by 2100	100%
MA	?	1990 by 2010; 10% below by 2020; 75% by 2100	?
ME	34%	1990 by 2010; 10% below by 2020; 75% by 2100	100%
NC	**122%**	**TBD**	**TBD**
NE Gov	?	1990 by 2010; 10% below by 2020; 75% by 2100	TBD
NM	**48-64%**	**2000 by 2012; 10% below by 2020; 75% by 2050**	**TBD**
NY	24%	5% below 1990 by 2010	?
OR	38%	1990 by 2010; 10% below by 2020; 75% by 2100	85%
Puget S.	37%	1990 by 2010; 10% below by 2020; 75% by 2100	100%
RI	35%	1990 by 2010; 10% below by 2020; 75% by 2100	100%

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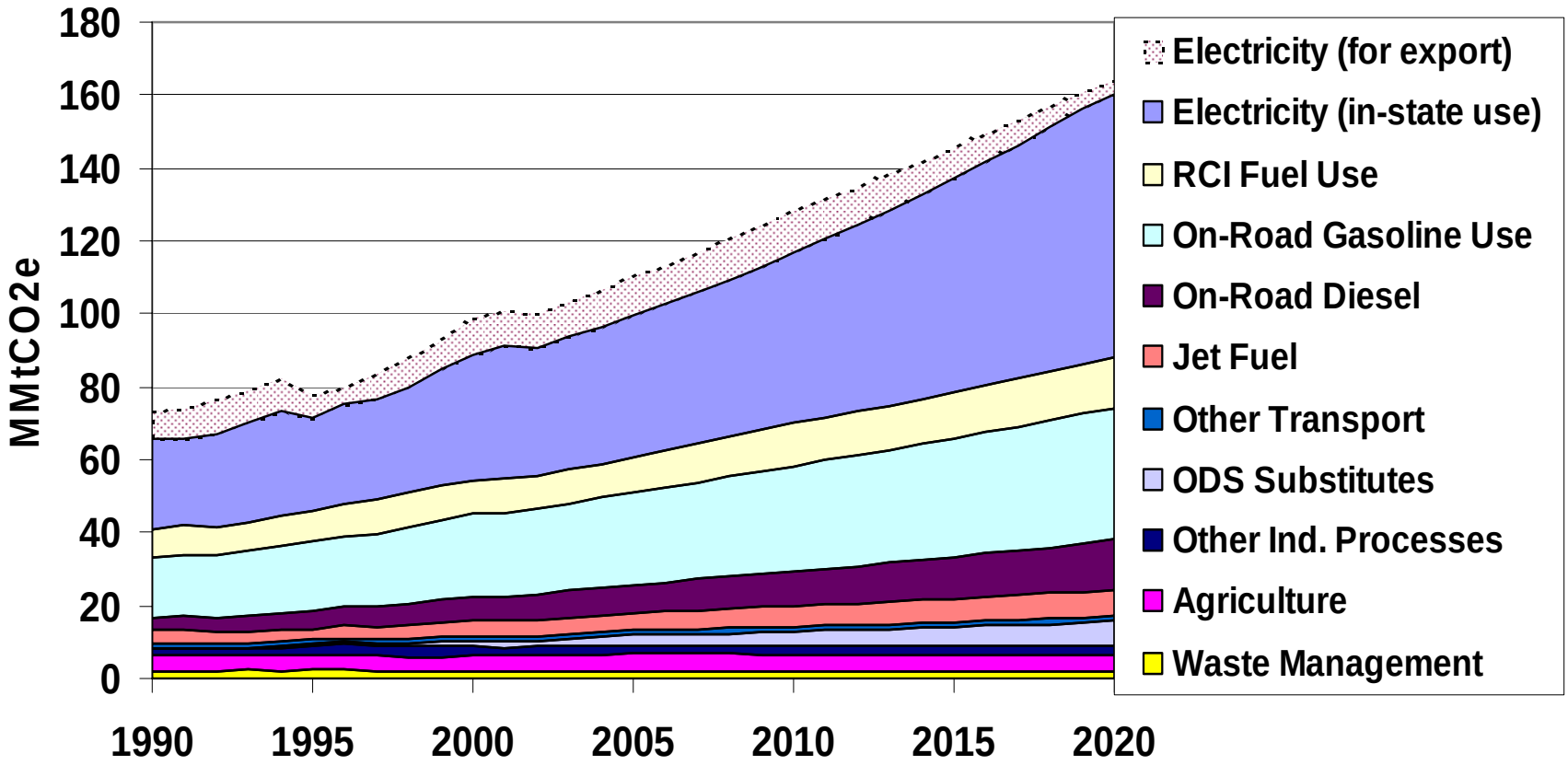
GHG Inventory & Forecast for AZ



Source: Arizona Inventory & Forecast, Final, CCS, 2006.

Emission Inventory & Forecast Results - AZ

- 89 MMtCO2e gross GHG in 2000
- -6.7 MMtCO2e forestry sinks
- 51% increase 1990 to 2000
- 2010 forecast = 117 MMtCO2e
- 2020 forecast = 160 MMtCO2e
- 39% contributions from both electricity consumption & transportation sectors.

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Mitigation Plan Development

- State environmental agency convenes stakeholder advisory group;
- Advisory group – representatives of government, industry, non-government organizations, and the public;
- Technical Workgroups – additional stakeholders work on inventory/forecast and policy development;
- Center for Climate Strategies – plan development facilitation and technical support.

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Plan Development – 10-Step Stakeholder Process

1. Develop initial GHG inventories and forecasts
2. Identify conceivable GHG mitigation options
3. Identify initial priority options for evaluation
4. Evaluate GHG reduction potential, cost effectiveness, ancillary and feasibility issues
5. Identify barriers, alternative policy design needs
6. Modify, add or subtract options as needed
7. Evaluate cumulative results of options
8. Iterate to consensus, with votes as needed
9. Aggregate options into implementation scenarios
10. Finalize recommendations and report language

Necessary Attributes of GHG Inventories

- Comprehensive:
  - cover all six IPCC gases, plus black carbon in AZ
  - cover all sources and sinks
- Years covered – 1990, 2000, 2010, 2020
- State/local data used with national defaults, as needed
- Emission estimates provided under both an energy production basis and a consumption basis.

GHG Inventory Sectors

- Energy Supply – electricity production and consumption, oil and gas production;
- Residential/Commercial/Industrial – fuel combustion, industrial processes;
- Agriculture – livestock, crop production;
- Waste – landfills, wastewater treatment;
- Forestry – sequestration in above- and below-ground carbon pools.

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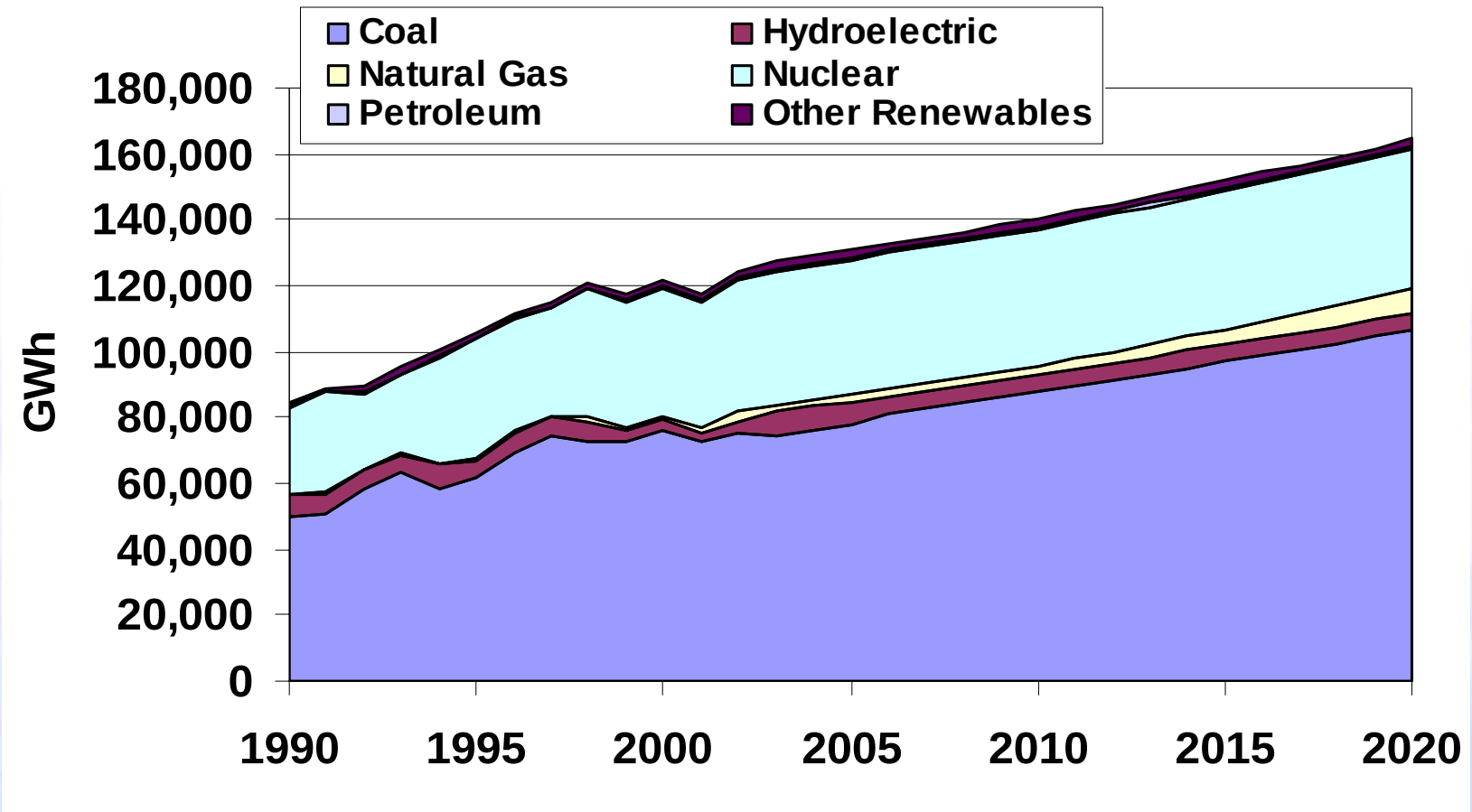
Tools Available for GHG Inventory Development

- EPA's State GHG Inventory Tool – SGIT
  - SGIT Basis – EIIP Volume 8
  - EIIP GHG Volume Under Revision
- STAPPA/ALAPCO's Clean Air & Climate Protection Software (CACP)
  - Estimates community-level emissions (GHGs and criteria pollutants)
  - Also quantifies government entity emissions

Energy Supply Methods/Data Sources

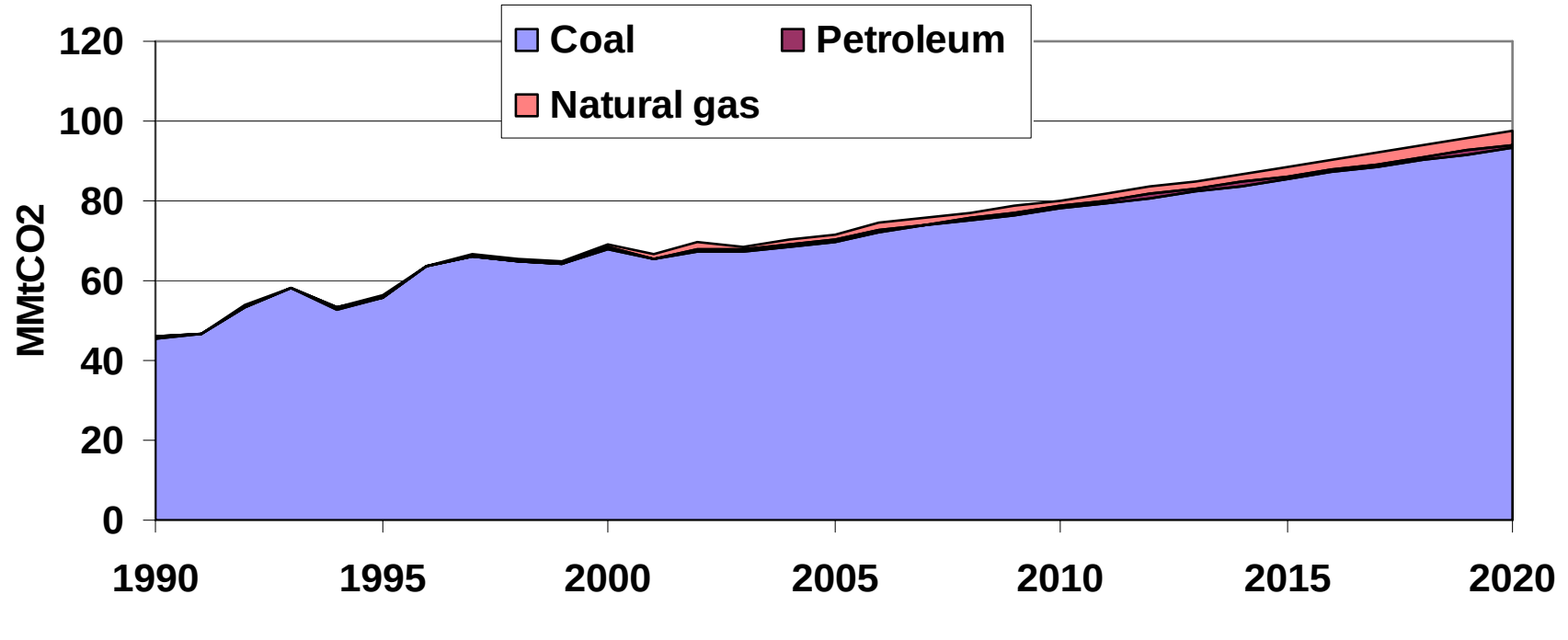
- Production-basis:
  - base year/historic - SGIT & DOE EIA State Energy Data, EPA's eGRID;
  - forecast years – EIA historical data, state energy forecasts, utility reporting;
- Consumption-basis (simplified method):
  - In-state Production CO_2e x [In-state e^- consumption/In-state e^- generation]

NC Electricity Generation Mix



Source: North Carolina GHG Inventory & Forecast, CCS, 2006.

NC Electricity Production Inventory & Forecast



Source: North Carolina GHG Inventory & Forecast, CCS, 2006.

Residential/Commercial/Industrial Sector Methods & Data Sources

- Residential/Commercial/Institutional Fuel Combustion – SGIT and DOE EIA SEDS with adjustments
- Industrial Process Emissions –
  - Non-fuel use of fossil fuels (SGIT adjusted for chemical manufacturing activity)
  - Industrial process emissions – SGIT, state environmental agency.

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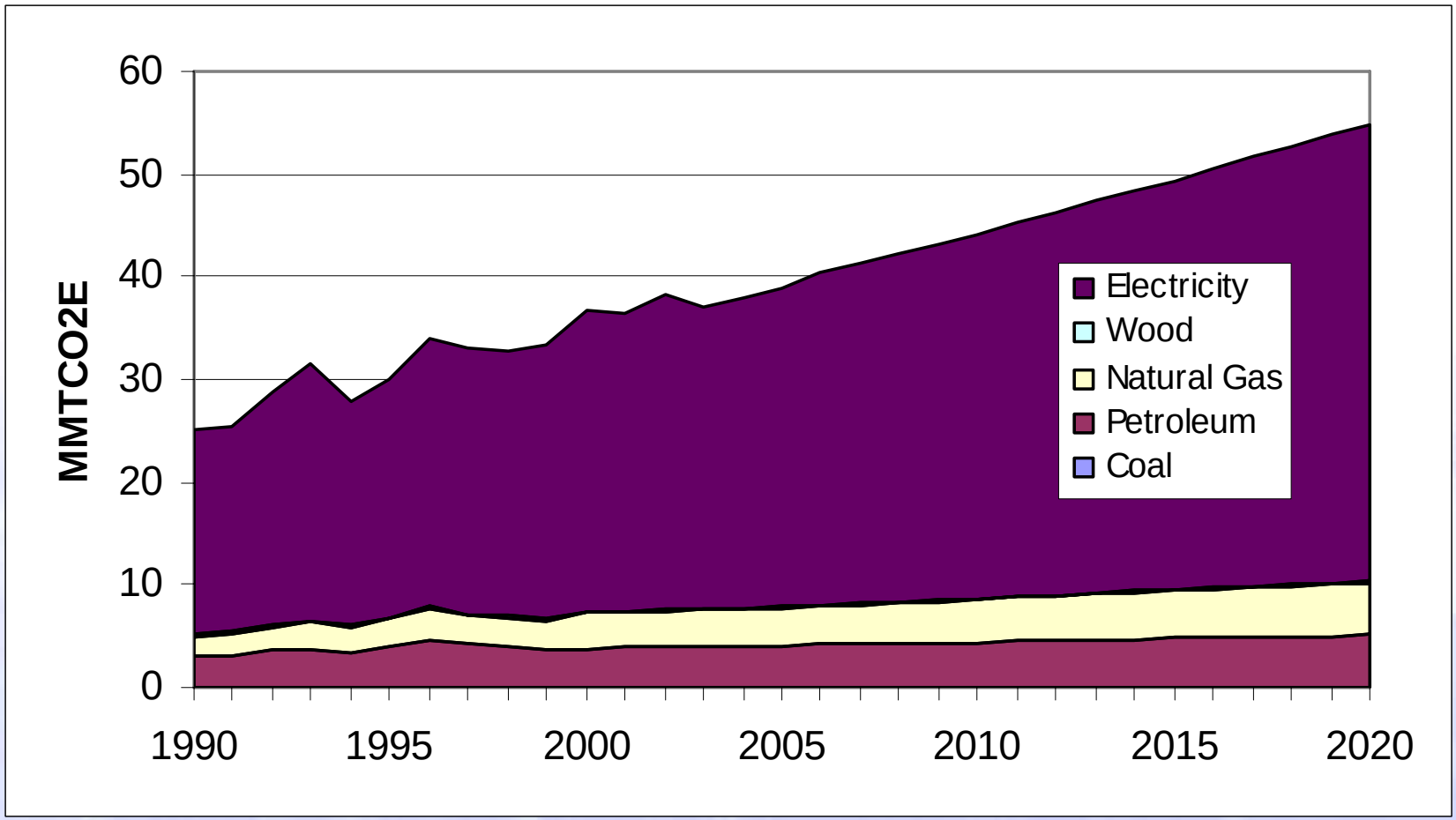
NC Residential Sector GHG Emissions



Source: North Carolina GHG Inventory & Forecast, CCS, 2006.

Transportation Sector Methods & Data Sources

- Onroad Vehicles –
  - Inventory - SGIT & SEDS state-level fuel consumption, state/local agency VMT estimates
  - Forecast – local agency VMT forecast, historical trends
- Nonroad Sources – SGIT/SEDS defaults, supplemented with state/local sources

Forestry Sector Methods & Data Sources

- U.S. Forest Service – FORCARB model based on Forest Inventory & Analysis Survey data;
- Carbon sequestration = change in inter-annual below- and above-ground carbon pools;
- Incorporate data on carbon removals (e.g. durable wood products; HARVCARB).

Agricultural Sector Methods & Data Sources

- Inventory – SGIT and default data (Census of Agriculture);

- Forecast – historical trends in livestock populations/crop acreage; data from state agencies or industry associations.

Waste Sector Methods & Data Sources

- Inventory – State agency data on landfills and wastewater treatment plants, SGIT defaults;

- Forecast:
  - Landfills – assess future reductions due to new Federal NSPS/EG;
  - Wastewater treatment – population forecasts.

Non-GHG Issues

- Aerosols – black carbon;
- Volatile organic compounds – new IPCC guidance?

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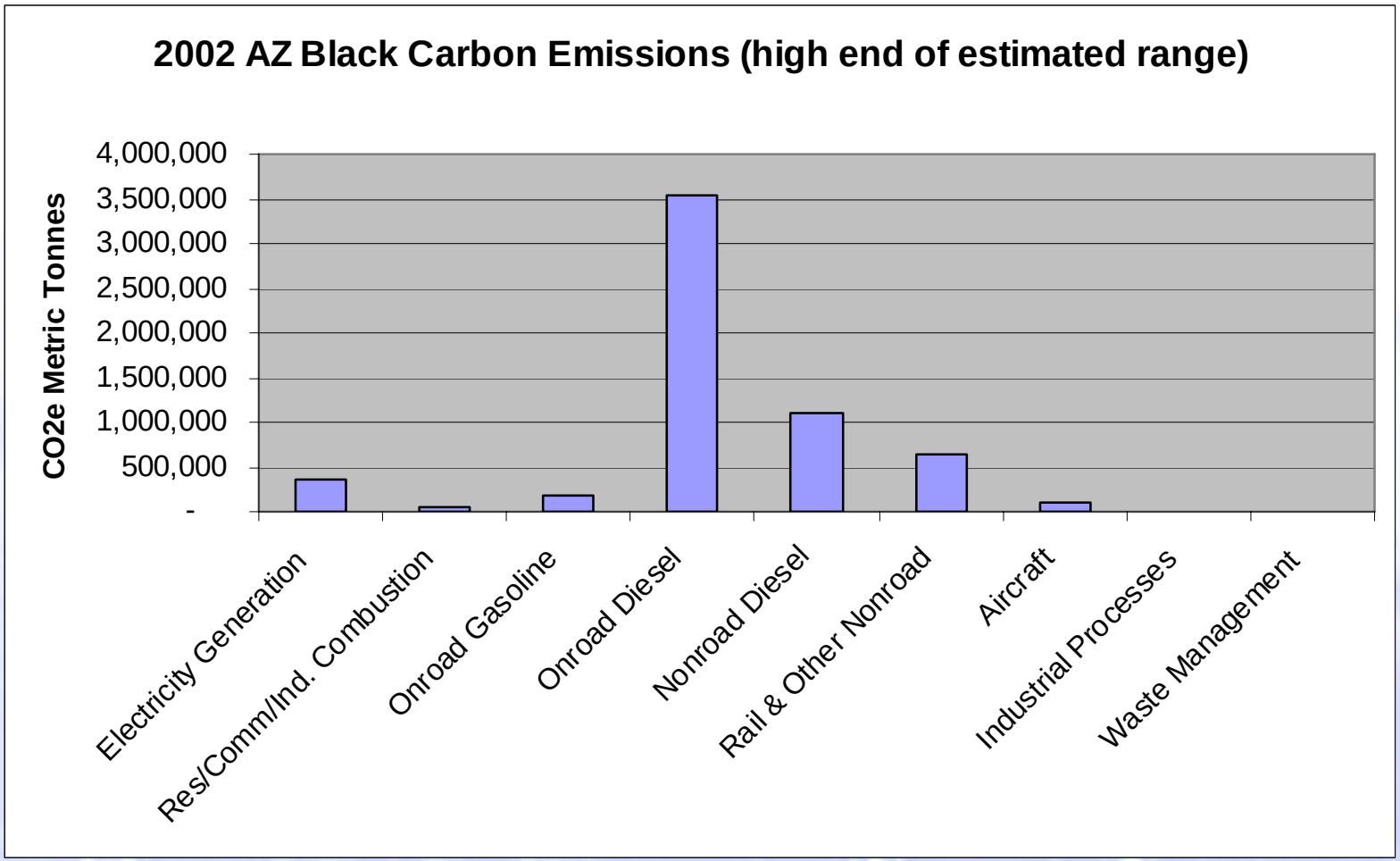
AZ Black Carbon Estimates



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Volatile Organic Compounds

Weight %	CAS#	Species	MW	Structure	Speciated Emissions (tons/year)	CO2e (tons/year)
25.95	78-78-4	Isopentane	72.15	C5H12	2,849	8,688
14.20	1634-04-4	Methyl t-butyl ether	88.15	C5H12O	1,559	3,891
6.60	106-97-8	N-butane	58.12	C4H10	724	2,193
3.88	109-66-0	N-pentane	72.15	C5H12	426	1,300
3.60	107-83-5	2-methylpentane	86.17	C6H14	395	1,211
3.17	108-88-3	Toluene	92.13	C7H8	348	1,163
3.16	540-84-1	2,2,4-trimethylpentane	114.22	C8H18	347	1,069
3.04	79-29-8	2,3-dimethylbutane	86.17	C6H14	334	1,023
2.88	513-35-9	2-methyl-2-butene	70.13	C5H10	316	992
2.45	646-04-8	Trans-2-pentene	70.13	C5H10	269	845
2.35	75-28-5	Isobutane	58.12	C4H10	258	782
1.98	96-14-0	3-methylpentane	86.17	C6H14	217	666
1.93	563-46-2	2-methyl-1-butene	70.13	C5H10	212	664
1.74	107-01-7	2-Butene	56.11	C4H8	191	598
1.62	590-18-1	Cis-2-butene	56.11	C4H8	178	558
1.30	627-20-3	Cis-2-pentene	70.13	C5H10	143	449
1.24	109-67-1	1-pentene	70.13	C5H10	136	427
1.17	110-54-3	N-hexane	86.18	C6H14	129	394
0.96	565-75-3	2,3,4-trimethylpentane	114.22	C8H18	105	324
0.93	115-11-7	Isobutylene	56.1	C4H8	102	320
0.90	96-37-7	Methylcyclopentane	84.16	C6H12	99	312
					remaining species	1,383
					Total CO2e	**29,251**

Conclusions

To ensure a policy-relevant inventory & forecast include:

- complete coverage of sources/sinks;
- complete coverage of GHGs, consider other climate forcing pollutants;
- State/local activity data, where possible;
- State/local forecast data (e.g. population, economic projections).

Document the inventory/forecast in a transparent report with accessible data sets.