ASCENT Supply Chain Tools and Projects

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ASCENT
AVIATION SUSTAINABILITY CENTER

ASCENT Team

Lead Universities:

Washington State University (WSU)

Massachusetts Institute of Technology (MIT)

Core Universities:

Boston University (BU)

Georgia Institute of Technology (Ga Tech)

Missouri University of Science and Technology (MS&T)

Oregon State University (OSU)

Pennsylvania State University (PSU)

Purdue University (PU)

Stanford University (SU)

University of Dayton (UD)

University of Hawaii (UH)

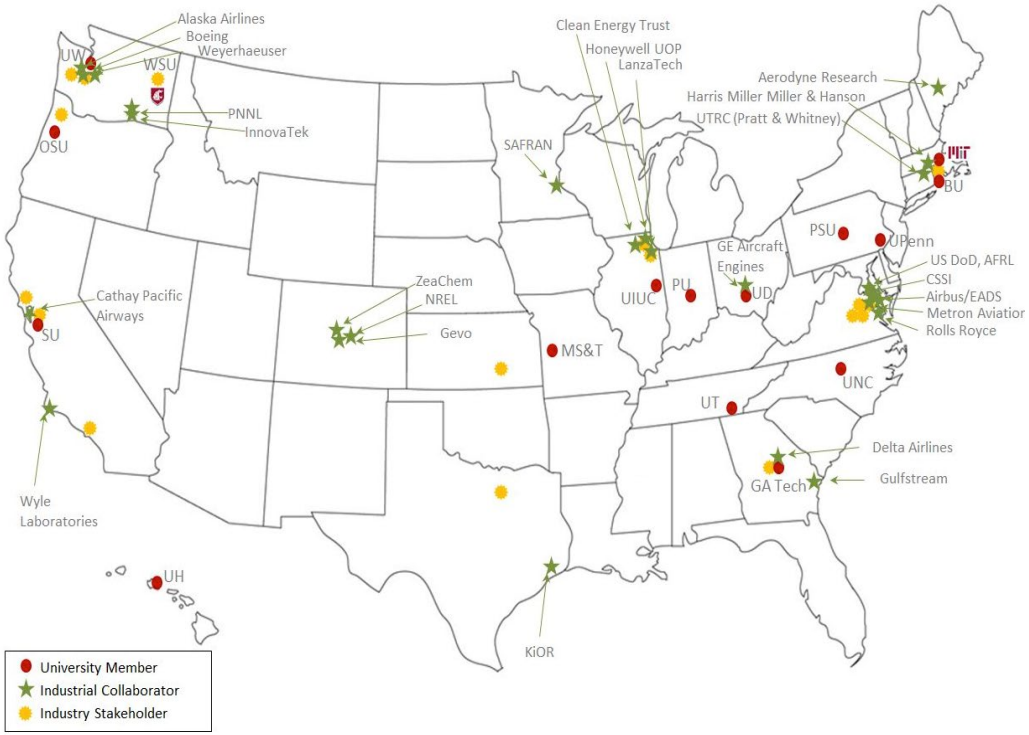
University of Illinois at Urbana-Champaign (UIUC)

University of North Carolina at Chapel Hill (UNC)

University of Pennsylvania (UPenn)

University of Tennessee (UT)

University of Washington (UW)



Advisory Committee - 58 organizations:

5 airports
4 airlines
7 NGO/advocacy
9 aviation manufacturers
11 feedstock/fuel manufacturers
22 R&D, service to aviation sector

ASCENT Focus Areas

Alternative Jet Fuels

Feedstock Development, Processing and Conversion

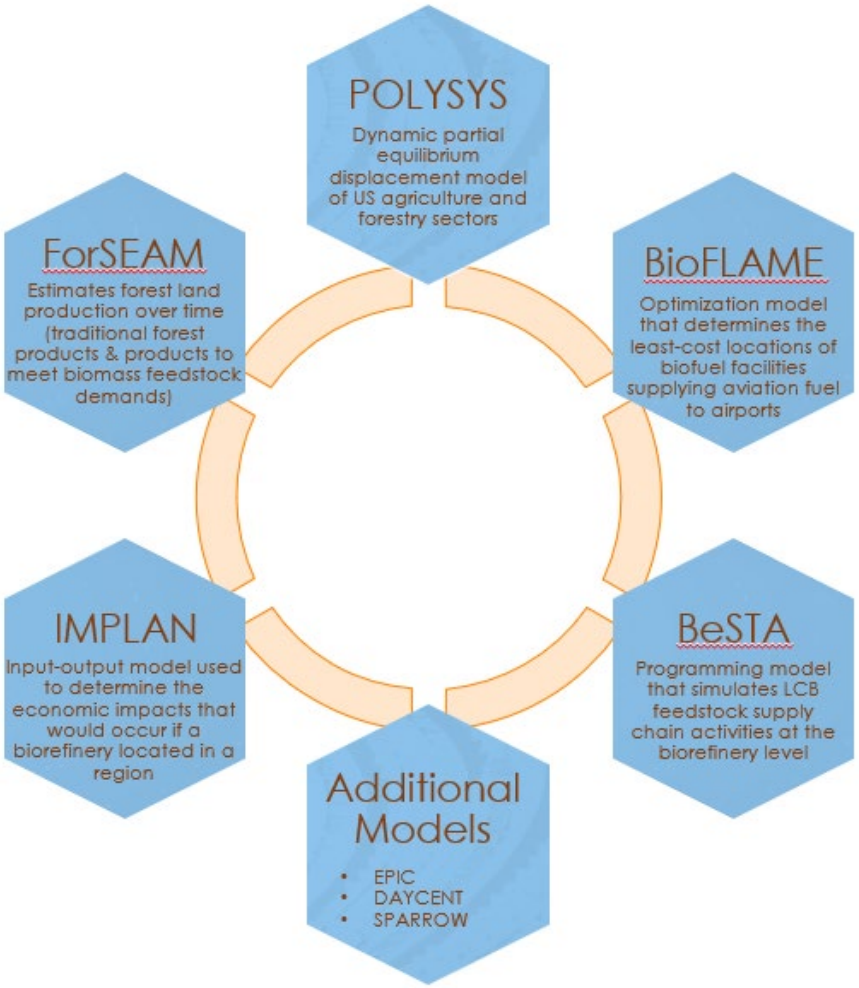
Regional Supply Chain Design and Analysis

Environmental Benefits Analysis

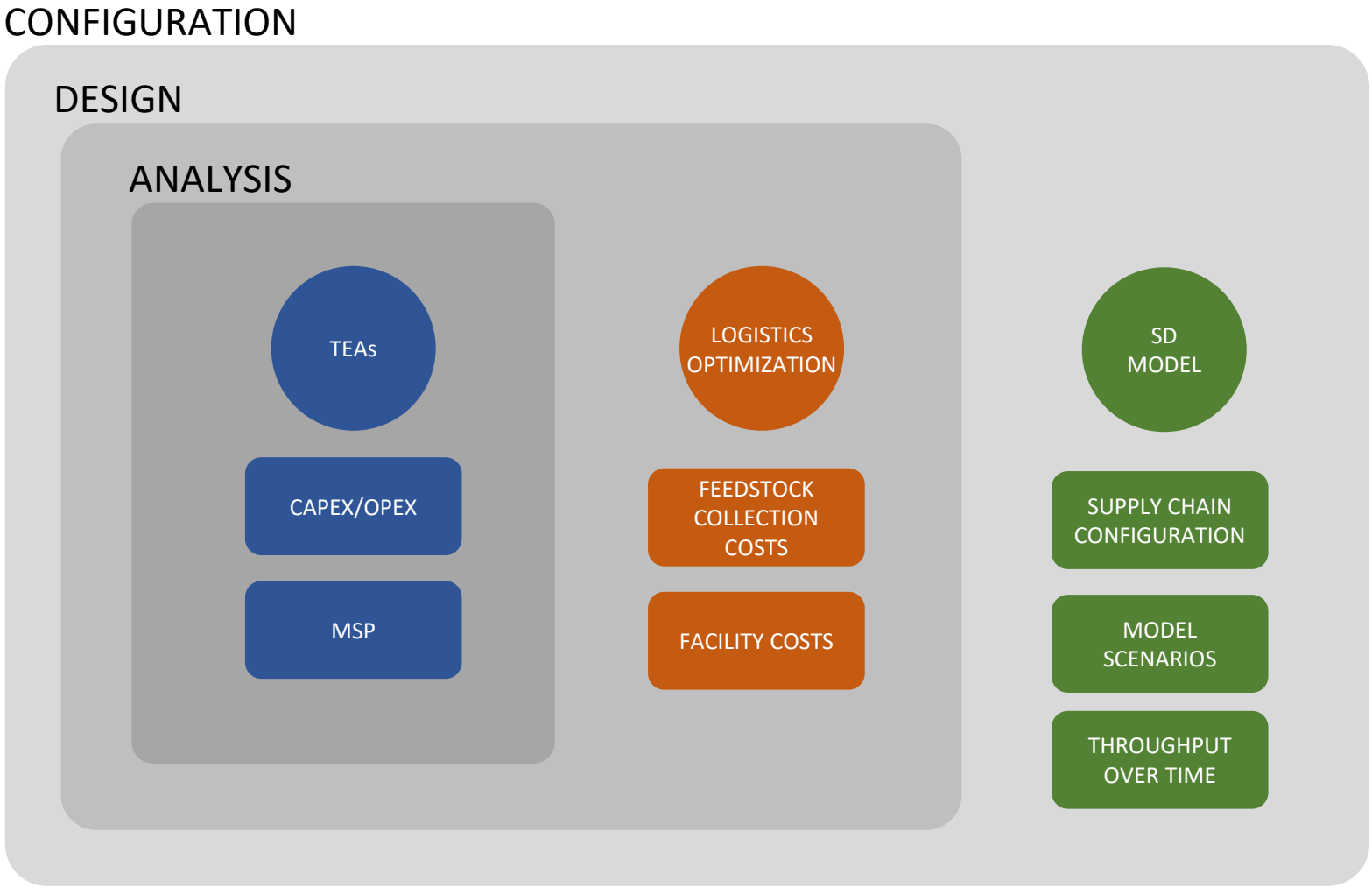
Aircraft Component Deterioration and Wear

Fuel Performance Testing

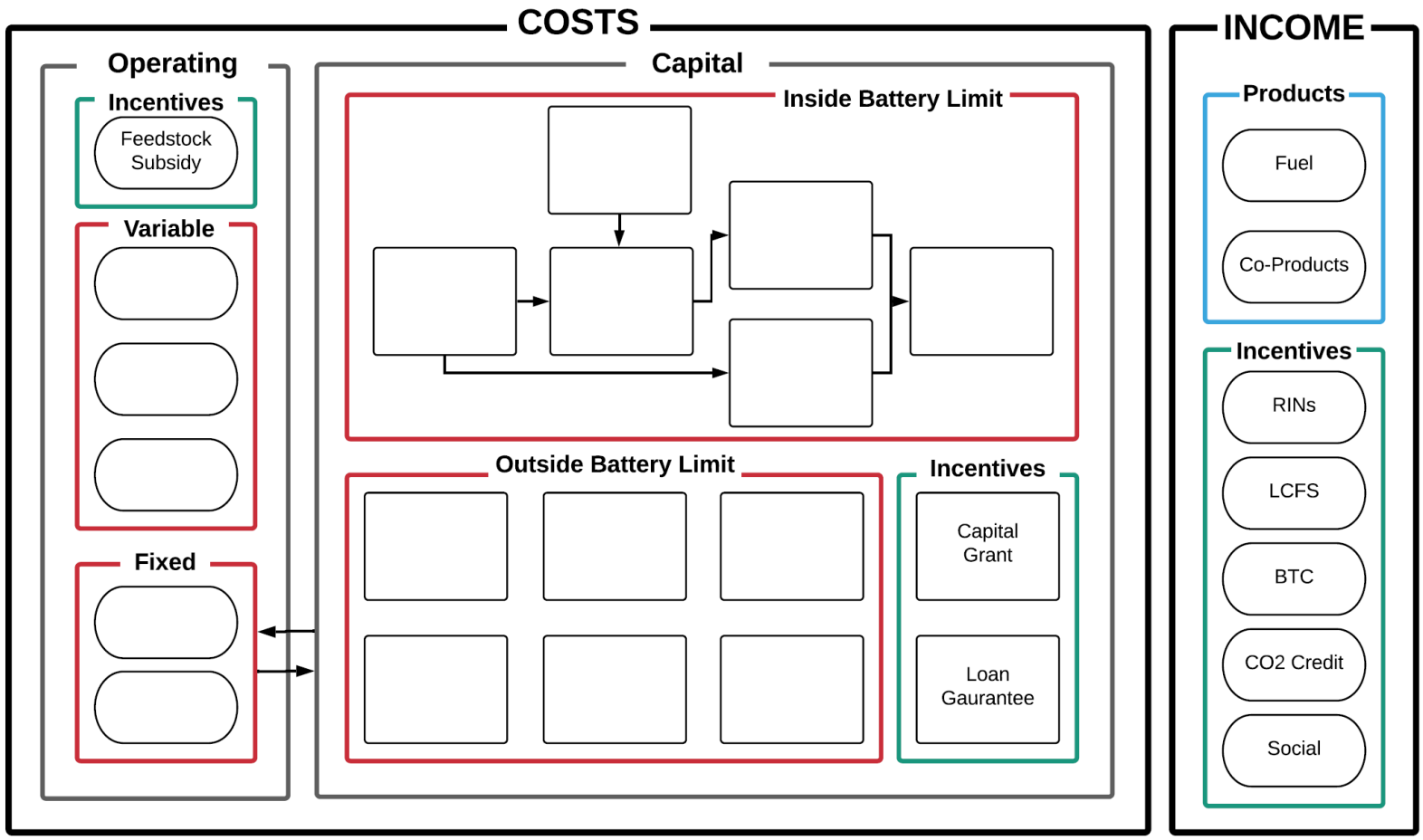
Leveraging UTenn Suite of Tools



ASCENT Supply Chain Tool Integration



Harmonized TEAs



Resource Siting Models

Buffer Layers

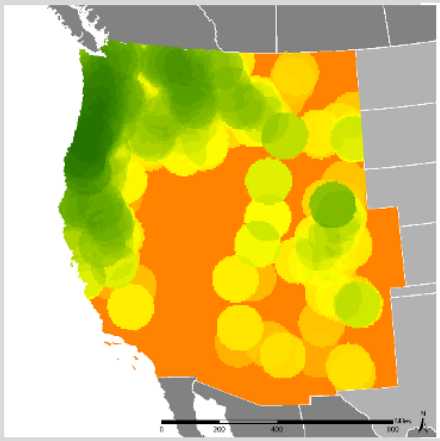
Highways

Railways

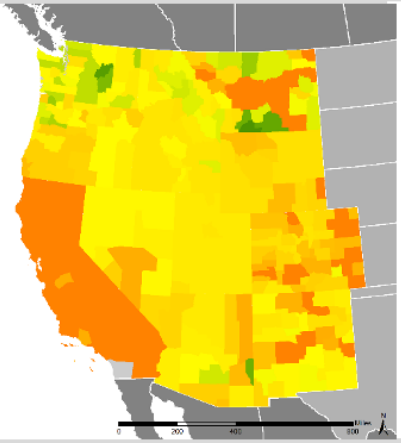
Natural Gas Pipelines

Cost Layers

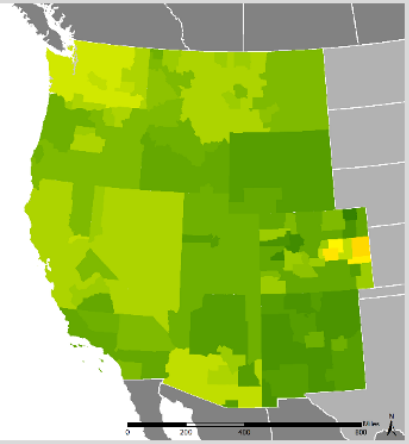
Incoming Feedstock Cost

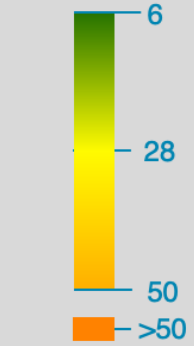


Electricity Cost



Natural Gas Cost





Optimization

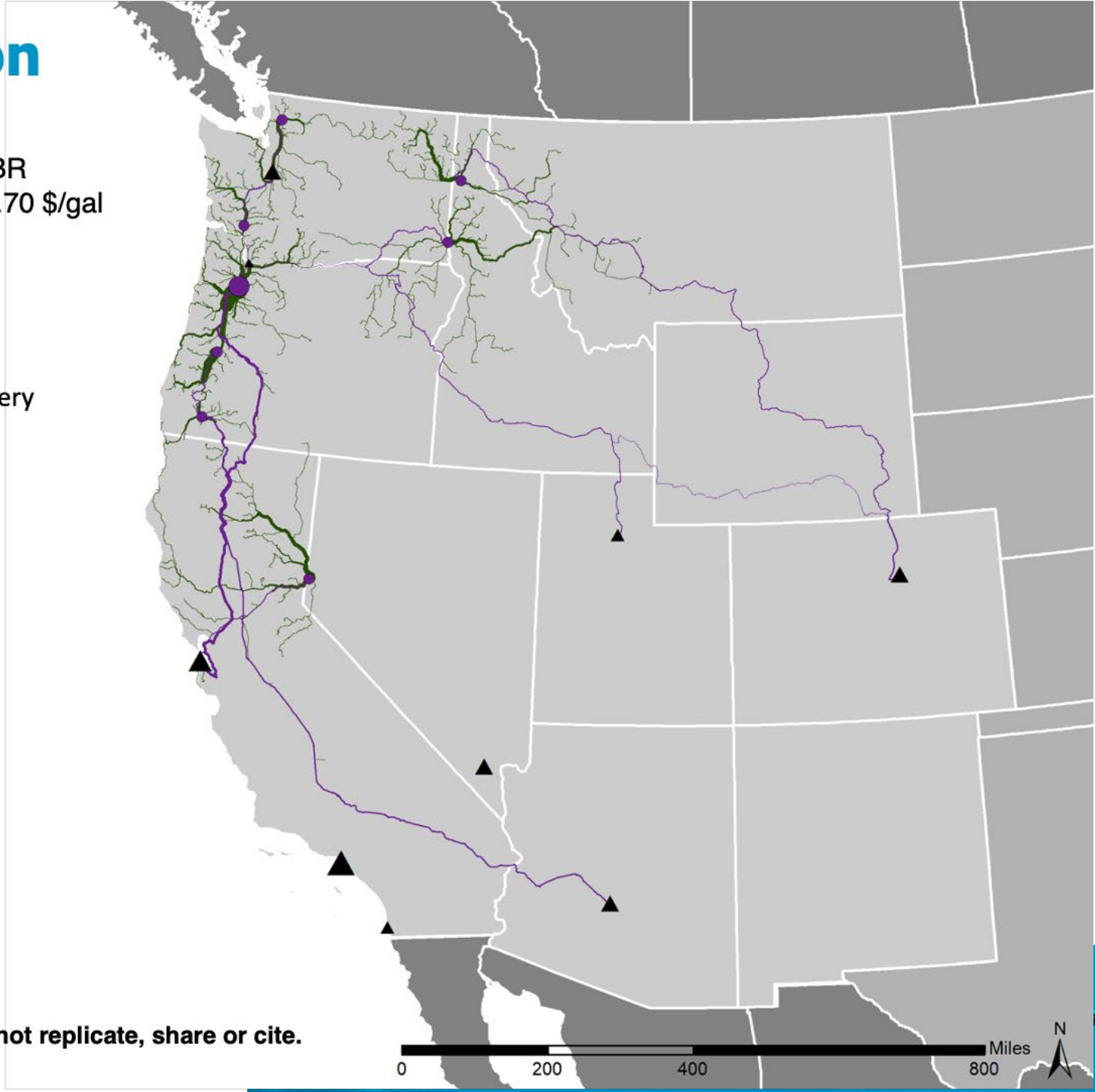
Scenario
Structure: IBR
Jet Fuel Cost: 5.70 $/gal

Nodes

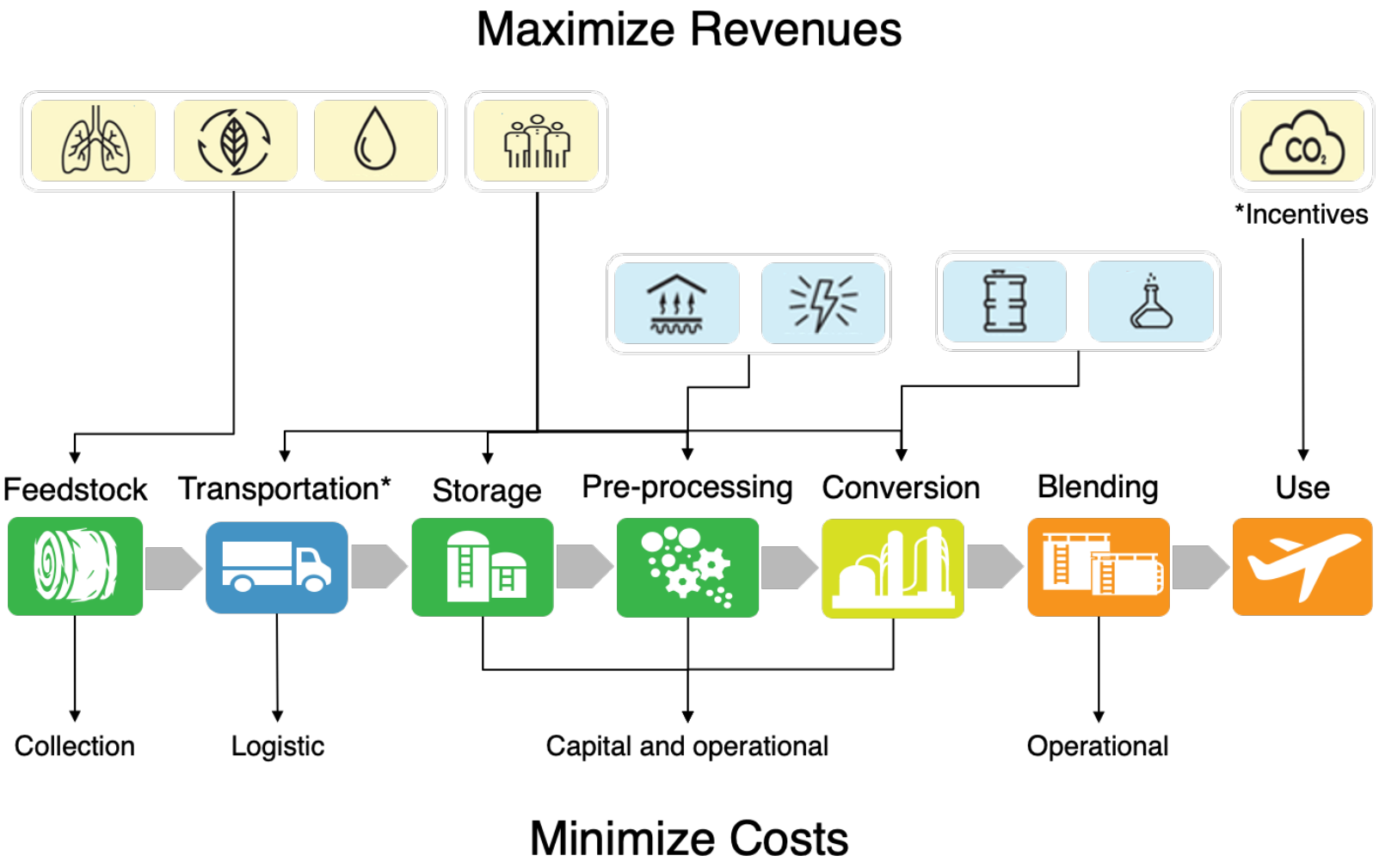
- Airport
- IBR/Upgrading Refinery

Links

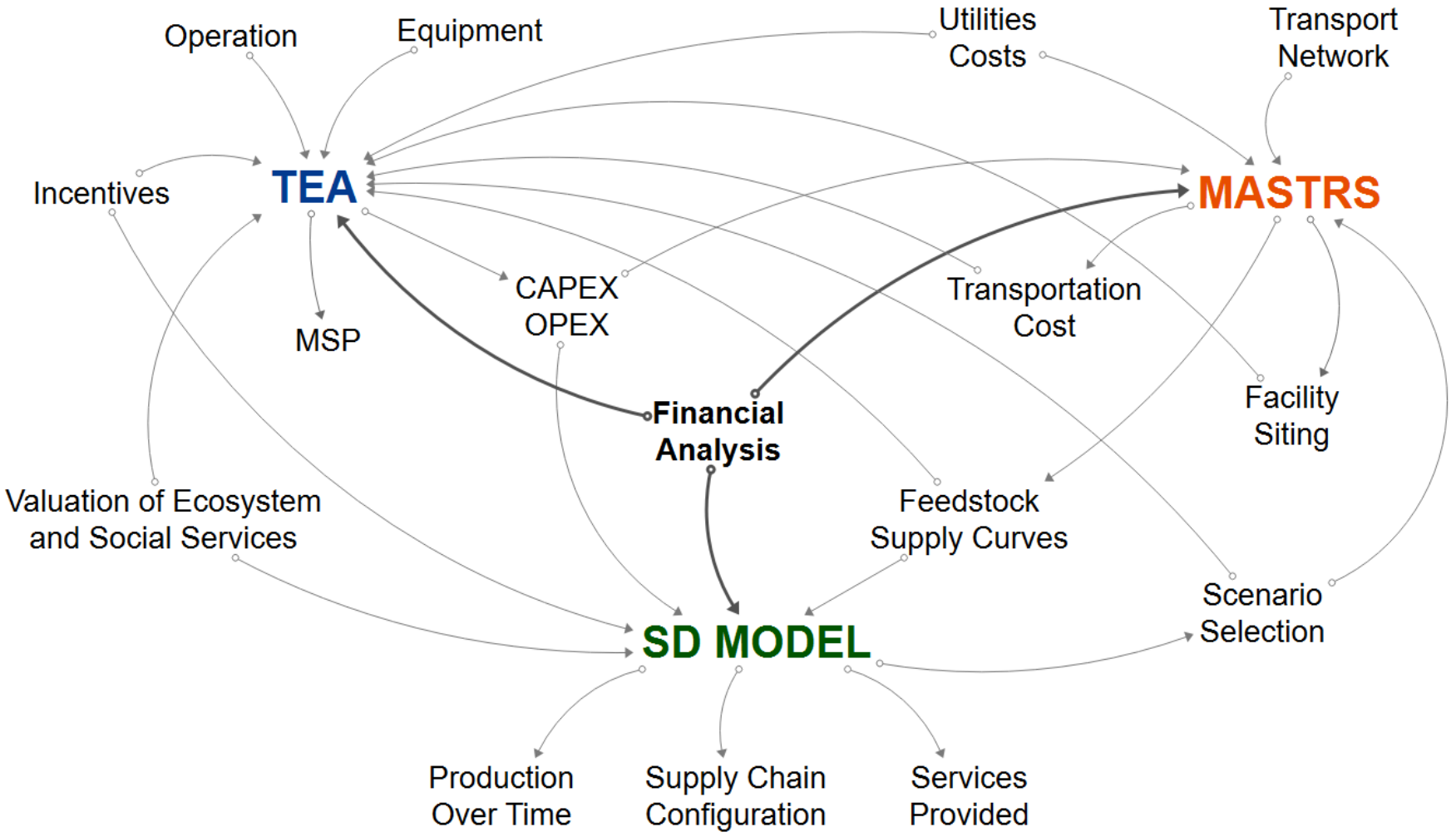
- From Feedstock
- To Airport



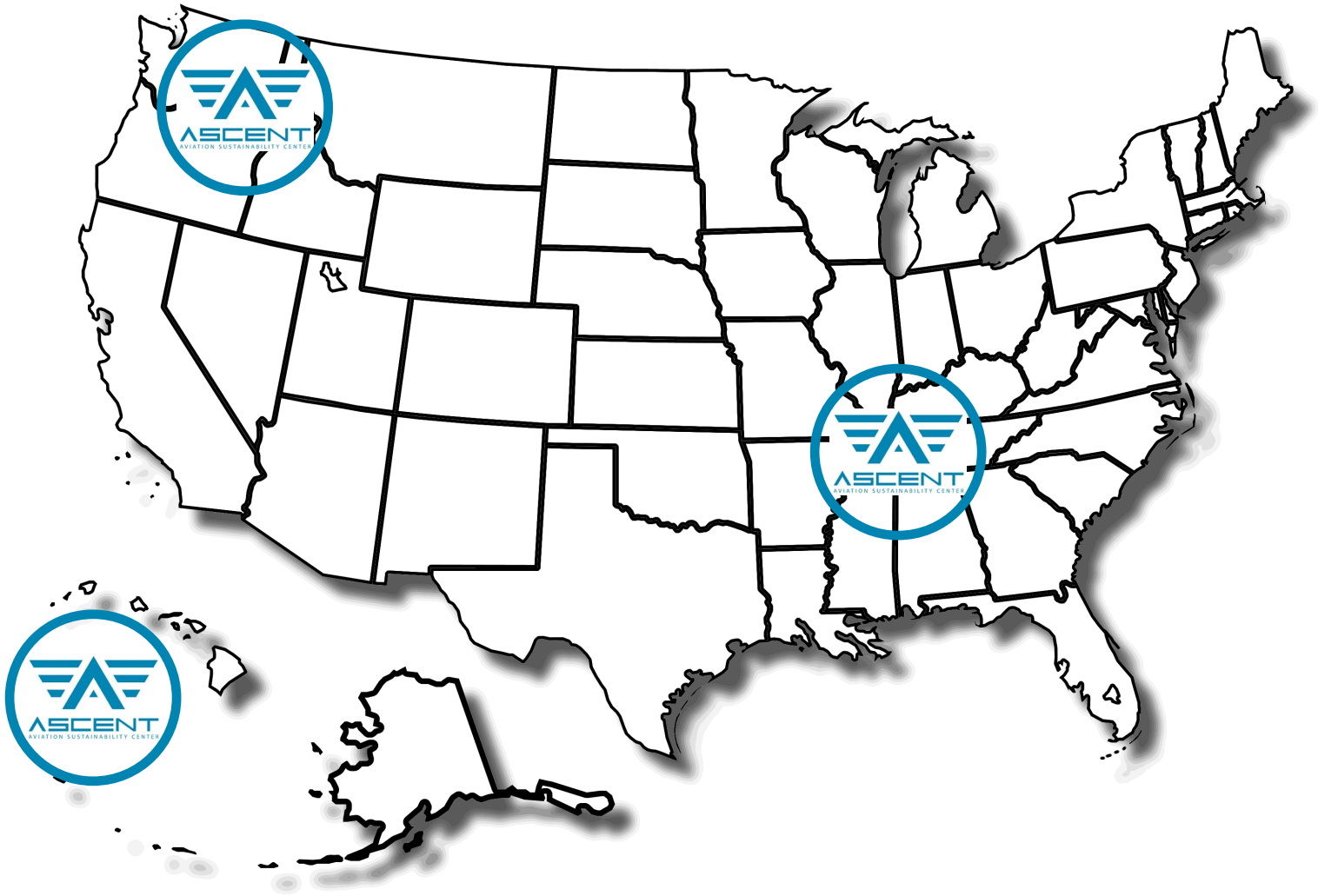
Supply Chain Configuration – Commodity + Services



Supply Chain Model Integration

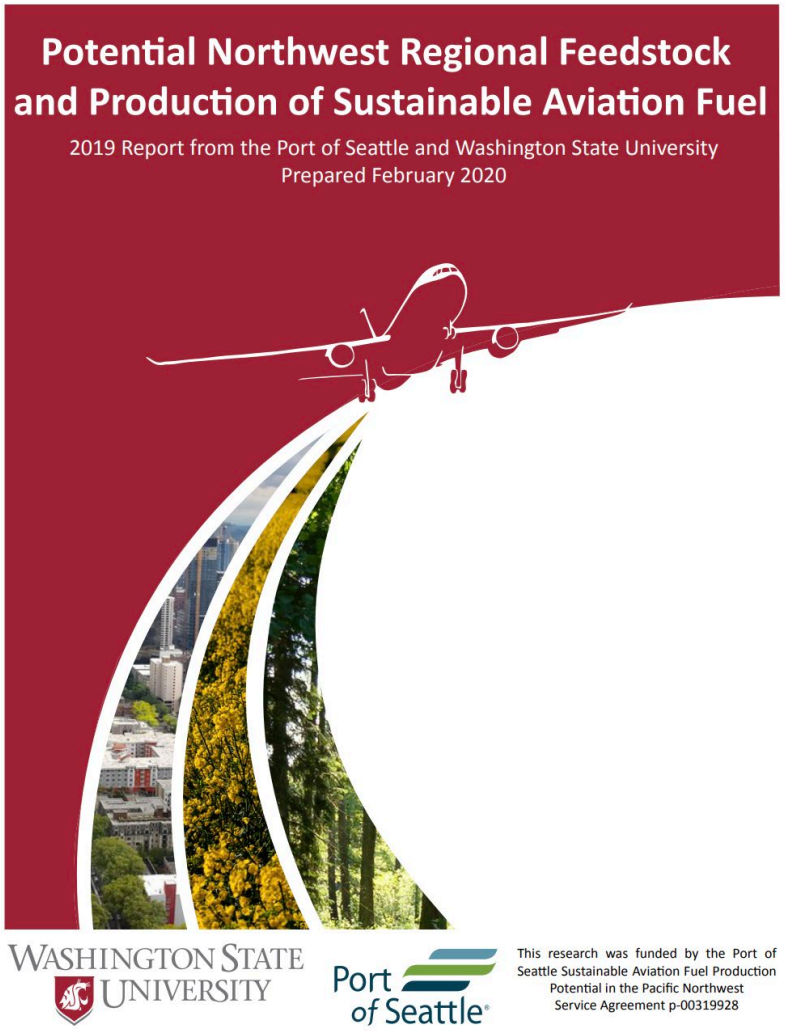


ASCENT Regional Projects



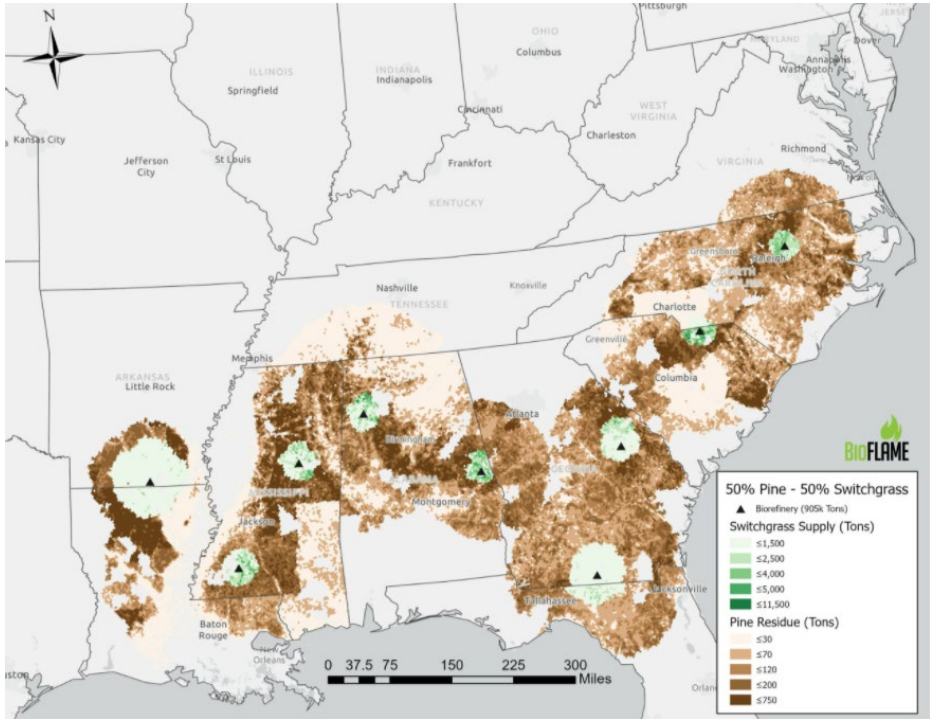
Pacific Northwest Regional Efforts

- Washington State Aviation Biofuels Workgroup
  - Since 2015
  - WA Clean Fuels Standard
- Port of Seattle – Regional Assessment
  - ASCENT Supply Chain Tools
  - Lipids/HEFA
  - MSW/GFT
  - Forest Residual/GFT/ATJ



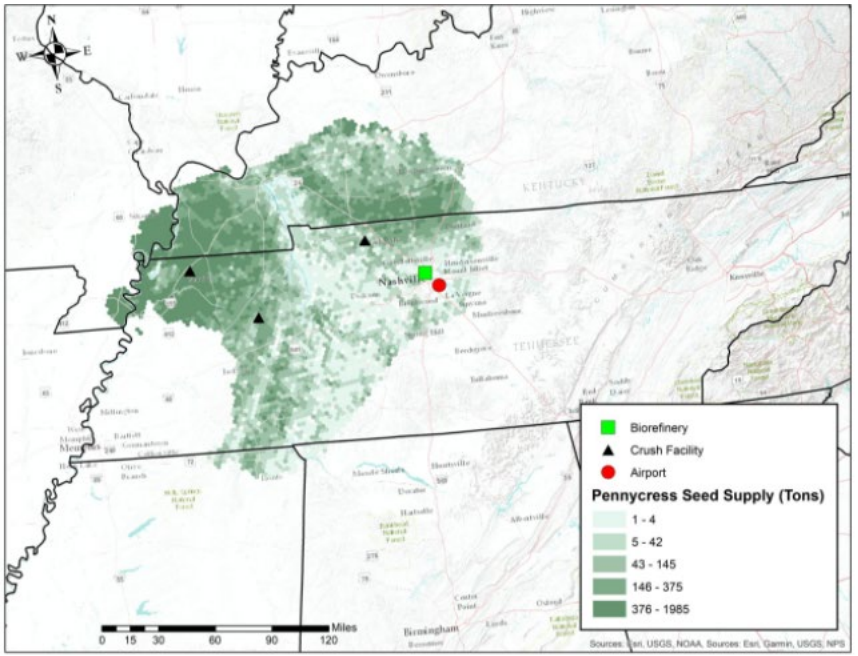
50% Pine / 50% Switchgrass

- The two feedstock together can serve nine biorefineries
- A total of 9.1 million tons of feedstock are needed
- Nearly 611 thousand acres of lands are used for feedstock
- The average feedstock cost is around $61.7 per dry short ton (~$68 per dry MT)



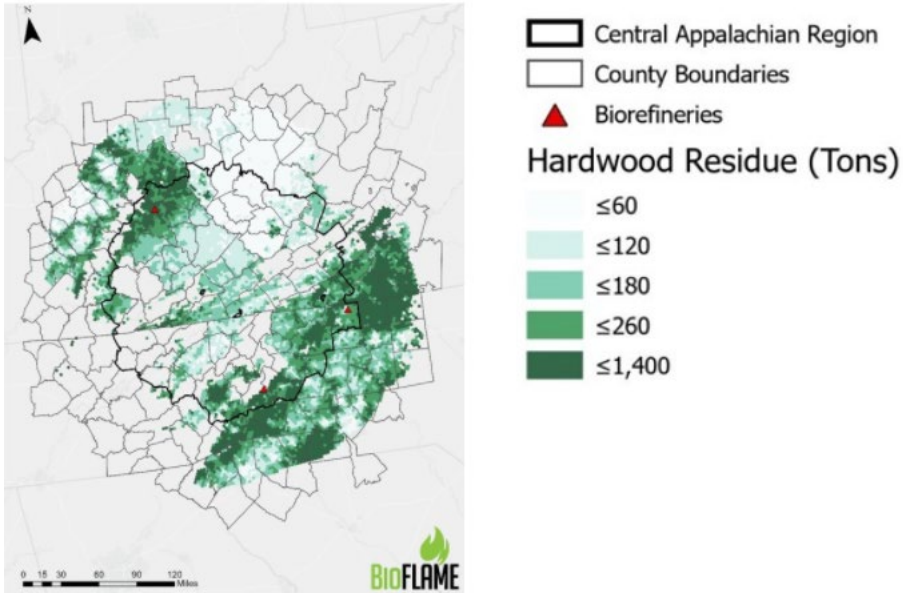
Nashville SAF from Pennycress

- Bio-oil feedstock costs from pennycress to feed a HEFA biorefinery to supply Nashville, Tennessee International Airport
- Three crush facilities are required
- The economic analysis shows that the pennycress oil could be available at the range from $0.80 to 1.09 per kg depending on whether the crush facility paid $0.081 to $0.108 per pound.

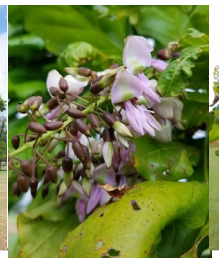


Central Appalachian SAF from Hardwood

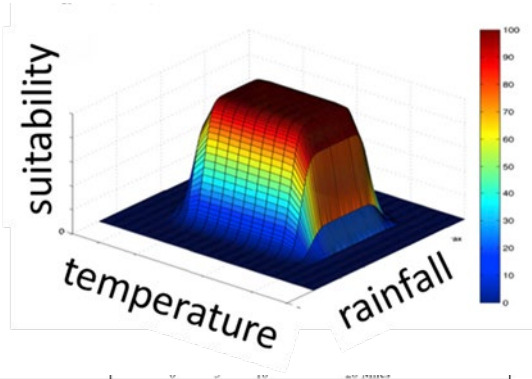
- Quantify and characterize woody biomass feedstock and identify optimal SAF and coproduct supply chains in the Central Appalachian Region (CAR)
- Three biorefineries could be located in the CAR to supply 545,000 dry short tons
- Total feedstock cost delivered to biorefineries is around $105 million

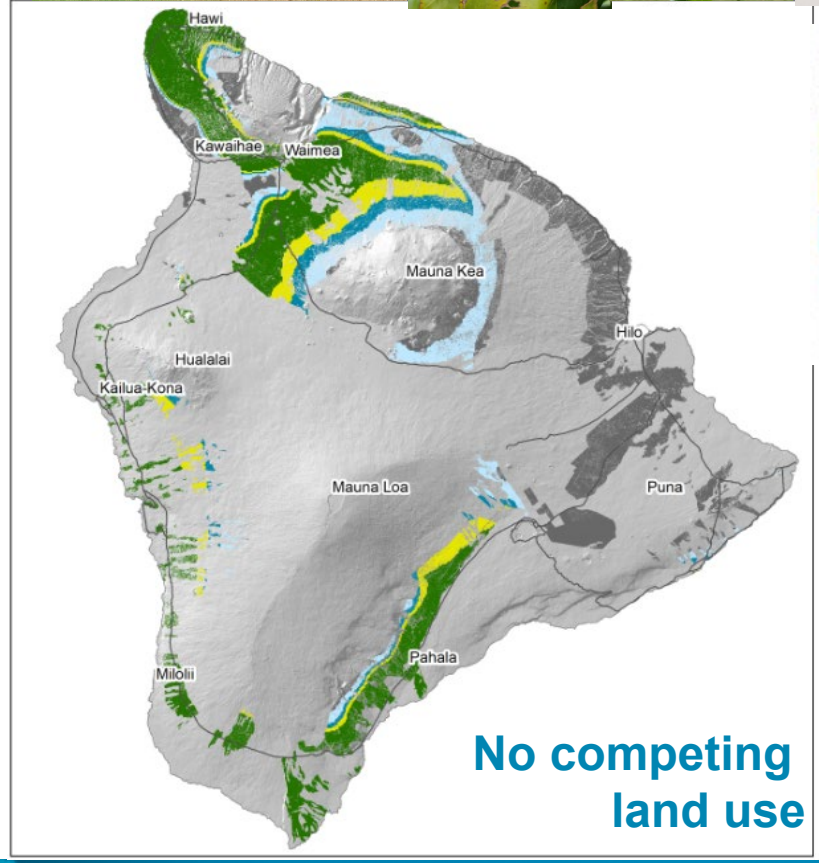


Pongamia (*Milletia pinnata*)

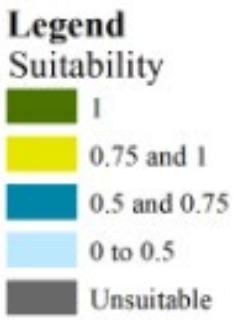



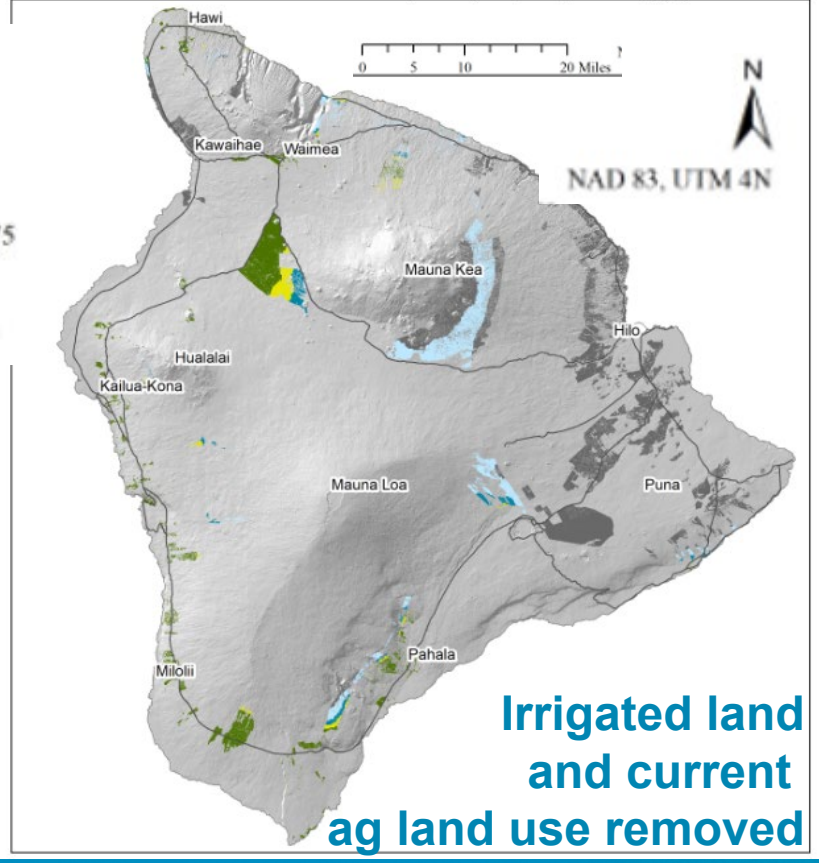

Eco Crop Model





No competing land use





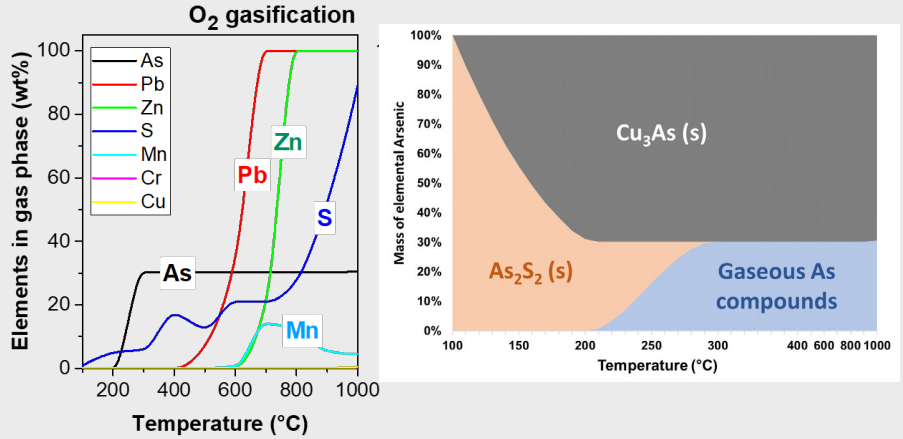
Irrigated land and current ag land use removed

C&D Waste Regional Project

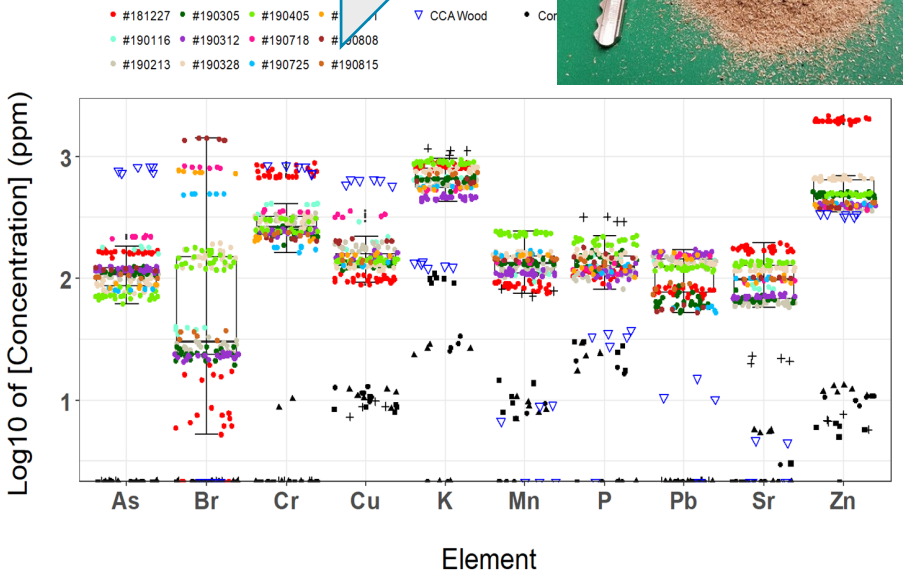
C&D Waste mined from landfill or truck intake

~50 kg feedstock sample

C&D Sampling



FactSage™ Model Prediction



Feedstock Analysis

QUESTIONS