Social Elements of Sustainable Alternative Jet Fuel Systems: Assessment & Applications

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Conclusion

Acknowledgements:

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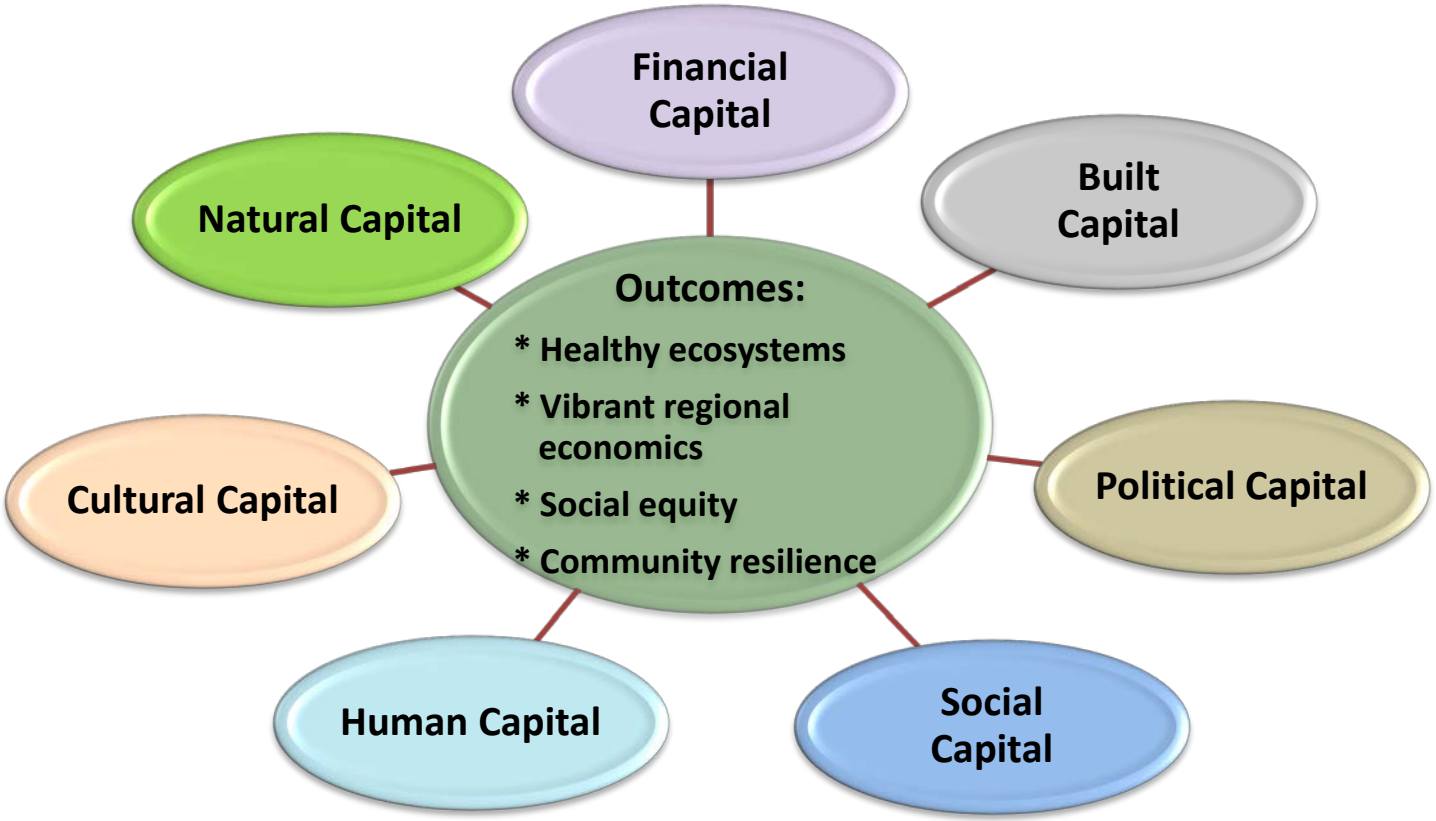
- *Follow-up work has been supported by the FAA-funded ASCENT project. (COE-2014-01)*

The Community Capitals Framework (CCF)

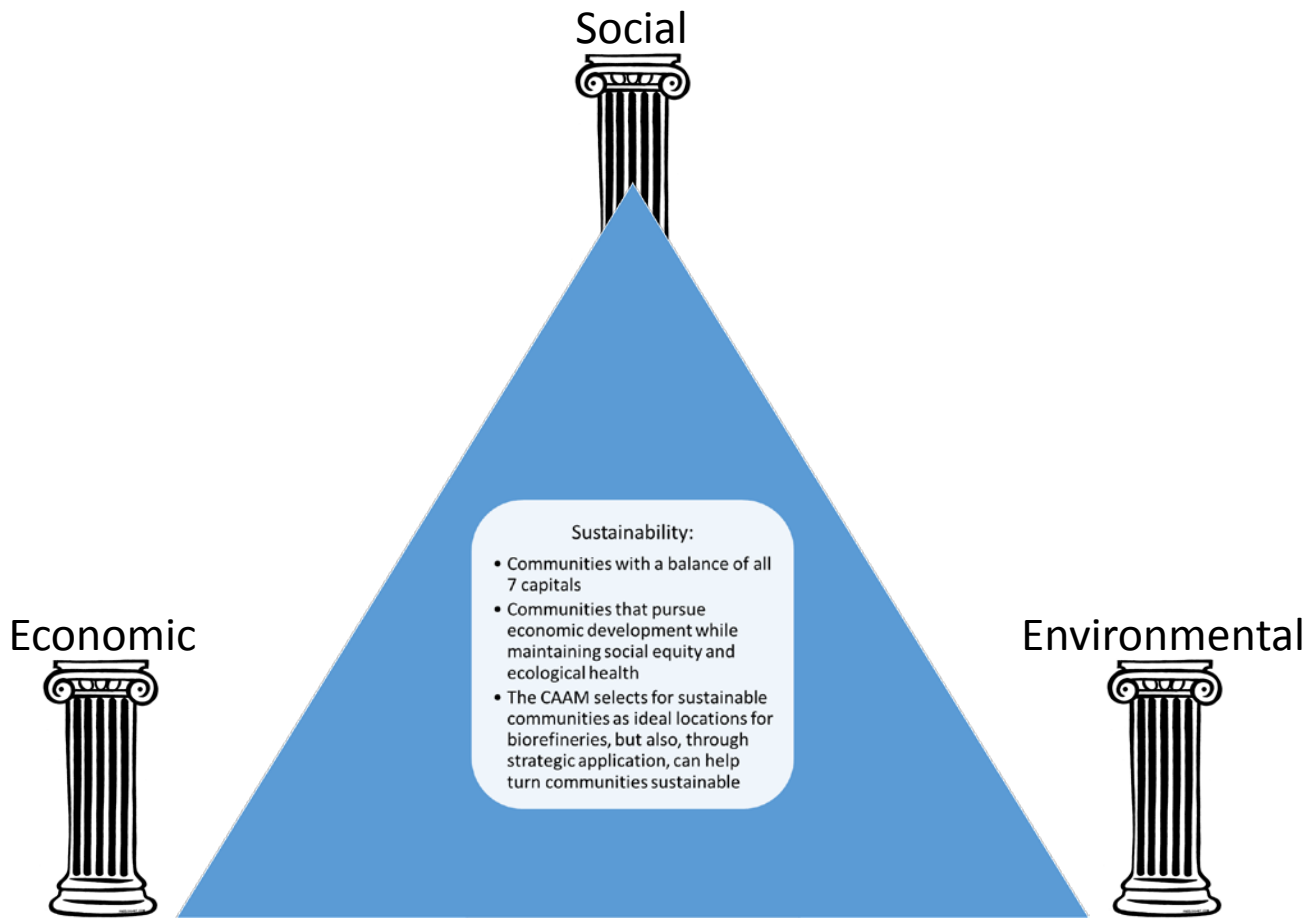


Drawn from: Emery, Mary and Cornelia Flora. 2006. "Spiraling Up: Mapping Community Transformation with the Community Capitals Framework." *Journal of the Community Development Society*, Vol. 37, p. 22.

Rationale

- Some assets more difficult to quantify
  - Measures of social cohesion, networks, creativity, and trust qualitative in nature
  - Lack of reliable, comparable data
- Research shows these elements are critical for the sustainability of complex economic and environmental projects.
- Research often ignores, or cursorily address these assets:
  - poor quantitative proxies, or
  - Examine only one facet of these assets, support.
- Including more robust measures of these assets enhances likelihood of success

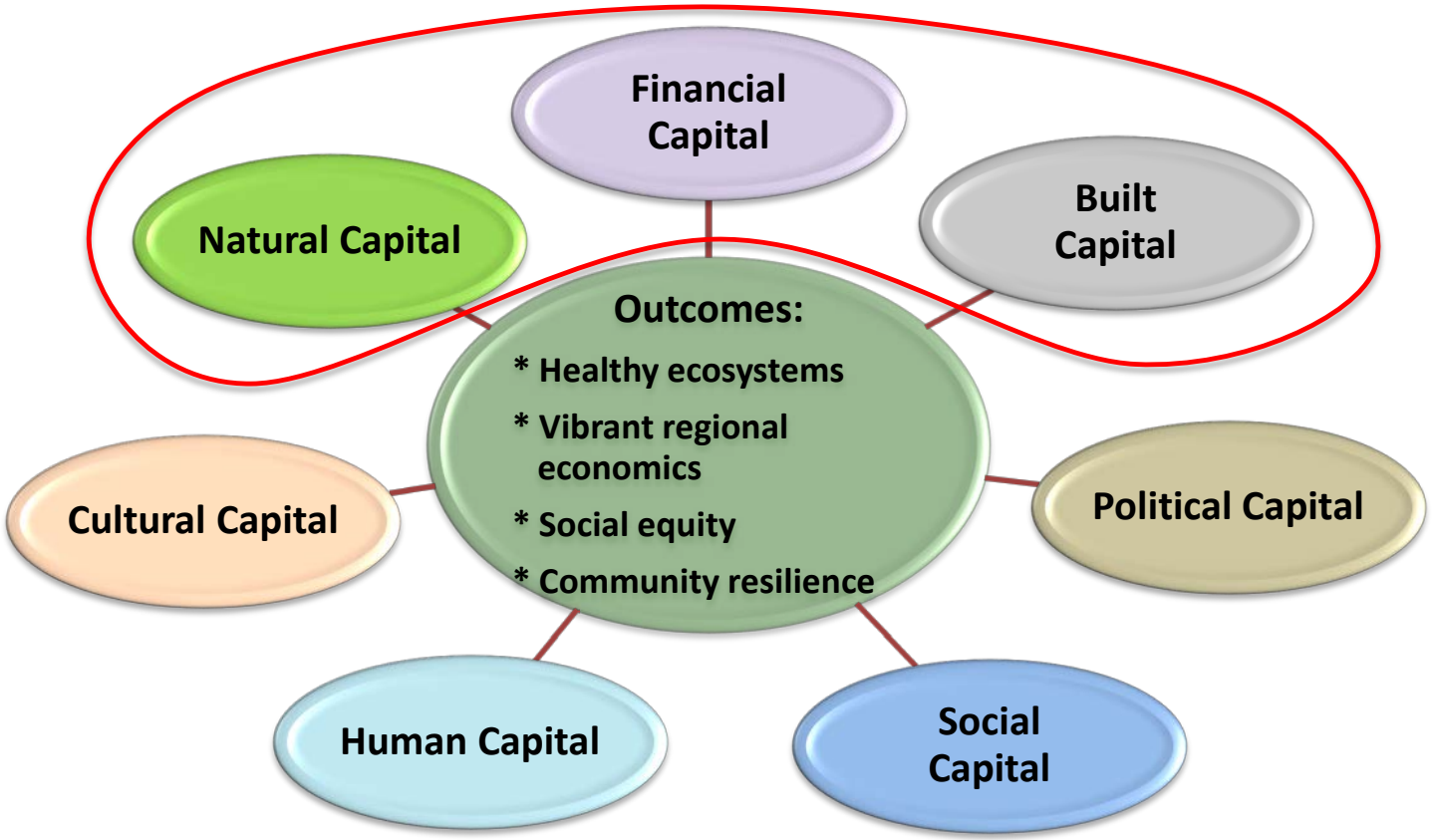
Sustainability



Project Applications

- CAAM: Community Attribute & Asset Model
  - Site Selection
  - (Later) Implementation
- (FAA) Refinery-to-Wing Stakeholder Assessment
  - Barriers & Opportunities for Implementation

The Community Capitals Framework



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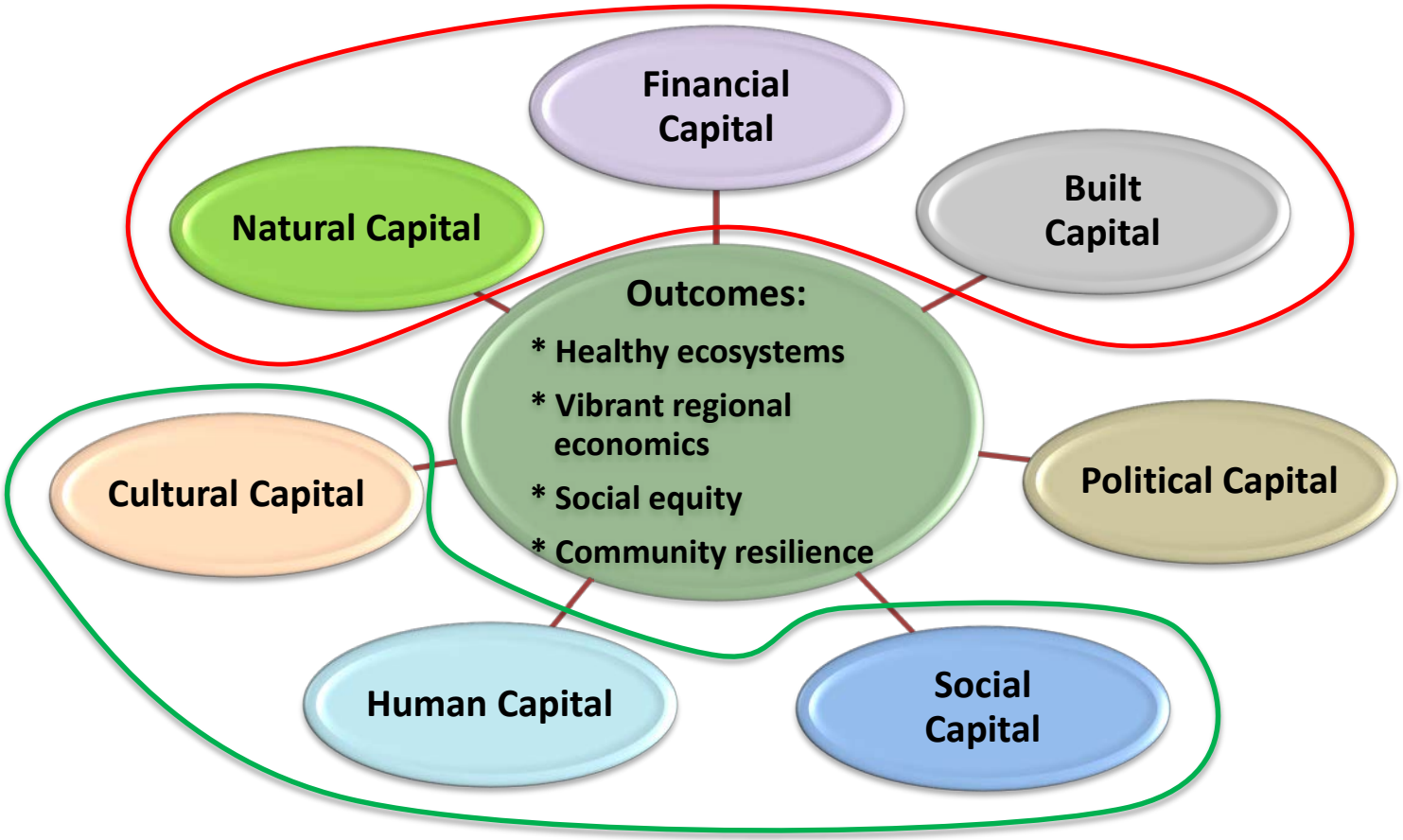
The Community Capitals Framework



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CAAM Background

Pilot study: Created model that allowed social capital and other social measures of CCF to be integrated into community site selection and implementation decisions:

- Compiled and refined national social asset datasets
- Developed model based on existing national data sets
- Validated model using case studies.
- Deployed with BGP assets in NARA WMC Region

Refined Model: Improved pilot model by including more robust measures of each social asset

- Updated national datasets with newest measures
- Validated with new case studies in WMC Region
- Deployed with prior BGP analysis (pilot study) in WMC Region
- Combined with updated BGP analysis in MC2P and Columbia Basin
- Long term goal: use robust CAAM model in other geographic regions of US, starting with Midwest.

CAAM Development Process

Step 1: Obtain, update, aggregate 3 national data sets

- WESTAF (Creative Vitality)
- Rupasingha (Social Capital)
- R. Wood Johnson (County Health Rankings)

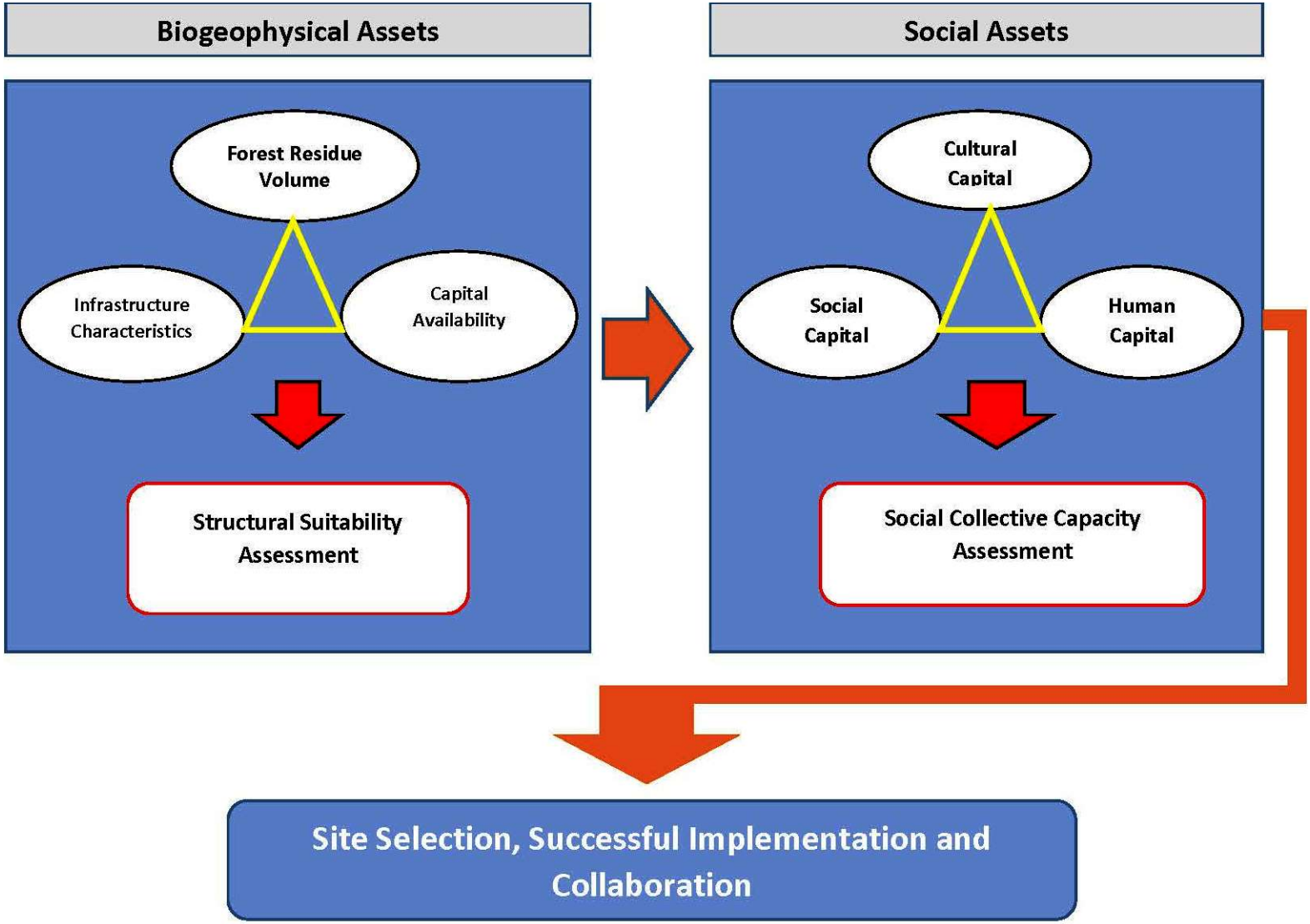
Step 2: Initial selection of representative variables

- Social Capital
- Cultural Capital
- Human Capital

Step 3: Validate and Refine Model

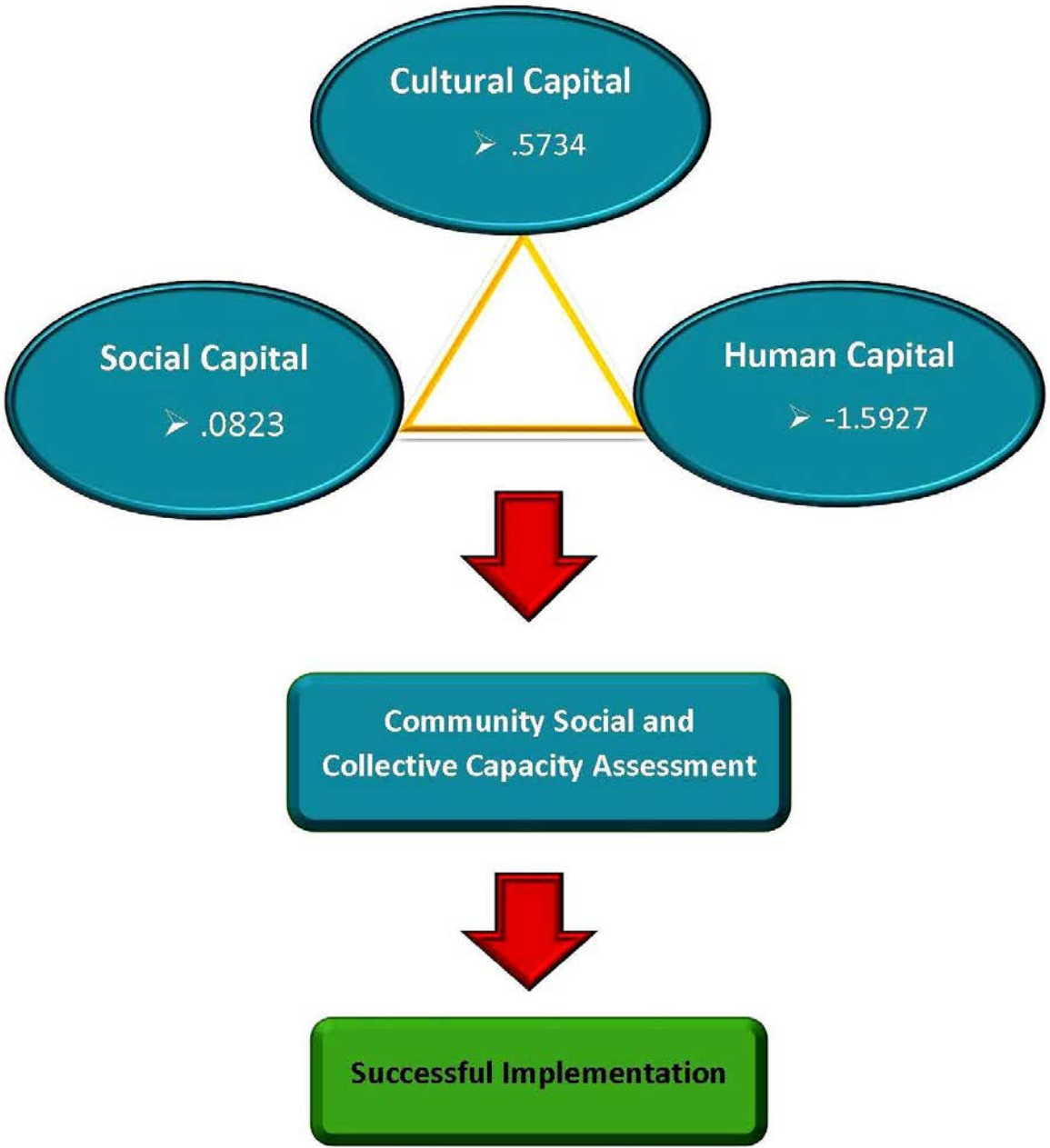
- Ground-truthing with previous work in the region
- New Primary Research
- Case Studies

Site Selection



NARA

Social Assets



Social Assets - Data Analysis

Phase I: (NARA) Data Aggregation & Measure Selection

- Obtain, update, aggregate 3 data sets
  - WESTAF (Creative Vitality)
  - Rupasingha (Social Capital)
  - R. Wood Johnson (County Health Rankings)
- Initial selection of representative variables
  - Social Capital
  - Cultural Capital
  - Human Capital

Social Assets - Data Analysis

Measure Selection: Retrospective Analysis

- **Building on previous model:** developed more robust measures of social assets by incorporating more aspects of social capital, cultural capital (cultural vitality) and human capital (health and education).

- Created regional benchmarks for each component that a community must meet for potential successful implementation.

- New benchmarks used to compare retrospective cases of successful and unsuccessful community projects in the NARA region and beyond.

Refined Measures

Measures used in current study and pilot study

Community Assets	Pilot Study	Refined Model
Social Capital • **Rupasingha et al, 2006**	# of Rent-Seeking Groups: political, labor, professional and business organizations	# Rent-Seeking Groups: political, labor, professional and business organizations # Non-Rent Seeking Groups: civic organizations, bowling centers, golf clubs, fitness centers, sports organizations and religious organizations # Non-Profit Organizations % Voter Turnout
Cultural Capital • **WESTAF**	$ Average annual revenues of arts related goods and services based on all revenues between 2002 and 2010	# Arts related organizations # Arts related business # Occupational employment in the arts $ Revenues of arts related goods and services
Human Capital • **County Health Ranks**	% Self-reports of poor health condition (physically and mentally)	Health: % Low birth-weight % Premature deaths % Obese (BMI >30) % Self-reports of poor health condition (physically and mentally) Poverty % Poverty (and % children in poverty) % Uninsured % Unemployed % No access to health due to costs Education: % Between age 25 and 44 with some post-secondary education Language:

Methodology

Retrospective Analysis of Comparative Case Studies

		WRICOPS Community Policing				*Endangered Species*		*Health*	
		Whatcom	**Kootenai**	**Yakima**	**Adams**	**Walla Walla**	**Okanogan**	**Lewis and Clark**	**Lake**
		Wash.	**Idaho**	**Wash.**	**Wash.**	**Wash.**	**Wash.**	**Montana**	**Montana**
		successful	successful	unsuccessful	unsuccessful	successful	unsuccessful	successful	unsuccessful
Variable	*Cut-off.*	2004	2000/2001	2006	2005	2005	2005	1999	1999
Soc Cap 1997	> .3730	-0.123	-0.903	-1.873	0.537	-0.193	-0.313	3.677	-0.063
Soc Cap 2005	> .1099	-0.0799	-0.8899	-1.6199	-0.2799	-0.5999	0.1001	2.6401	-0.2199
Soc Cap 2009	> .0413	-0.1313	-0.8413	-1.5013	-0.6113	-0.6013	-0.0813	2.4587	0.0687
CVI 2006	> .673	0.095	-0.103	-0.315	-0.435	-0.112	-0.291	0.359	-0.094
CVI 2007	> .689	0.091	-0.067	-0.32	-0.479	-0.149	-0.322	0.289	-0.181
CVI 2008	> .699	0.052	-0.07	-0.319	-0.462	-0.02	-0.291	0.226	-0.207
CVI 2009	> .705	0.053	-0.147	-0.309	-0.537	-0.115	-0.282	0.234	-0.218
CVI 2010	> .686	0.052	-0.072	-0.306	-0.52	0.004	-0.235	0.239	-0.236
Health 2013	< -1.4247	-2.2753	-1.6953	2.4947	1.9347	-0.8253	2.1847	-0.5053	1.2247
Obesity 2013	< 25.8	-1.5	-0.2	6.6	11.2	2.8	1.6	-2.3	1.8
Poverty 2013	< .3337	-1.2637	0.0663	1.9563	1.3063	-0.4437	2.2663	-2.7937	2.0663
Education 2013	> 58	12.7	7.8	-16.5	-21.5	3.4	-13.4	17.2	3.6
Language 2013	< 3.2	-1	-2.8	8.1	15.6	2.1	2.4	-2.9	-3
Population 1997		154249	98767	218318	15541	53501	38652	53251	25341
Population 2005		185556	126843	228819	16574	57304	39091	58150	27933
Population 2009		200434	139390	239054	17732	59059	40552	61942	28605
Population 2013		203663	141132	247141	19027	59588	414111	64318	28947

Note: Shaded cells represent scores that are better than the cut-off points. Cut-off scores are based on averages for the respective years and variables for the region West (US census region) over 446 counties. For social capital and cvi scores data from Alaska and Hawaii is missing. See tables A6 through A11 for averages for other regions. See tables B1 for raw scores of the cases on each capital instead of differences from the cut-off points.

CAAM Model

Phase II: (NARA - ASCENT) Testing & Ground-Truthing

- Used Retrospective Prediction Comparison (4 extant regional studies) to refine selection of social assets metrics validates against successful and unsuccessful prior collaborative outcomes in the NARA region
- High confidence in NARA region county-level measures to estimate: social capital, creative leadership, and public health status

Refined Capital Measures

Community Assets	Preliminary Model	Refined Model
Social Capital Rupaingha et al. (2006)	# Rent-Seeking Groups: political, labor, professional and business organizations	# Rent-Seeking Groups: political, labor, professional and business organizations # Non-Rent Seeking Groups: civic organizations, bowling centers, golf clubs, fitness centers, sports organizations and religious organizations # Non-Profit Organizations % Voter Turnout
Creative Capital WESTAF	$ Average annual revenues of arts related goods and services based on all revenues between 2002 and 2010	*Creative Vitality Index including:* # Arts related organizations # Arts related business # Occupational employment in the arts $ Revenues of arts related goods and services
Human Capital County Health Ranks	% Self-reports of poor health condition (physically and mentally)	% Obese (BMI >30) % Low birth-weight % Premature deaths % Self-reports of poor health condition (physically and mentally) % Poverty (and % children in poverty) % Uninsured % No access to health due to costs % Between age 25 and 44 with some post-secondary education % Non-proficiency in English

Note: Table shows what variables were used to measure the community assets in each model. The first study provided an outset of community assets on which the second model builds forth. This refine and reliable model can be used to predict the likelihood of community cooperation.
Note: All counts (#) and amounts ($) are calculated as a rate of the population per 10.000.

Methodology

Analysis of Western Montana Corridor

Case analysis of community capitals in western Montana corridor - differences

Variable	*Cut-off.*	**Bonner Idaho**	**Kootenai Idaho**	**Boundary Idaho**	**Spokane Washington**	**Lincoln Montana**	**Lake Montana**	**Flathead Montana**	**Missoula Montana**
Soc. Cap. 1997	> .3730	-0.243	-0.903	-0.513	-0.763	0.437	-0.063	0.887	1.167
Soc. Cap. 2005	> .1099	-0.4099	-0.8899	-0.8399	-0.5099	0.6201	-0.2199	0.8701	2.0701
Soc. Cap. 2009	> .0413	-0.2413	-0.8413	-0.0813	-0.6313	0.7287	0.0687	0.6587	1.8387
CVI 2006	> .673	0.034	-0.103	-0.282	0.074	-0.253	-0.094	0.261	0.915
CVI 2007	> .689	0.305	-0.067	-0.389	0.069	-0.245	-0.181	0.347	0.894
CVI 2008	> .699	0.009	-0.07	-0.411	0.074	-0.16	-0.207	0.504	0.921
CVI 2009	> .705	-0.029	-0.147	-0.428	0.051	-0.177	-0.218	0.425	0.956
CVI 2010	> .686	0.064	-0.072	-0.403	0.056	-0.171	-0.236	0.560	0.946
Health 2013	< -1.4247	-0.4753	-1.6953	-1.5153	-0.0253	1.0947	1.2247	-1.6953	-2.3753
Obesity 2013	< 25.8	-3.1	-0.2	-2.1	2.2	-0.2	1.8	-4	-5.3
Poverty 2013	< .3337	1.4263	0.0663	2.0863	-1.0037	3.2563	2.0663	0.1963	-0.9537
Education 2013	> 58	-2.1	7.8	-22.8	12.1	-10.7	3.6	3.1	16
Language 2013	< 3.2	-2.9	-2.8	-3.2	-1.7	-3.2	-3	-3.1	-2.9
Population 1997		34771	98767	9882	404650	18772	25341	71705	88818
Population 2005		39925	126843	10388	440488	18704	27933	82601	102239
Population 2009		41403	139390	10951	468684	18717	28605	89624	108623
Population 2013		40808	141132	10804	473761	19566	28947	91301	110138

Note: Numbers indicate the difference between the score per capital per county and the applicable cut-off score. Shaded cells represent scores that are better than the cut-off points. Cut-off scores are based on averages for the respective years and variables for the region West (US census region) over 446 counties.

Ascent Social Asset Assessment

4.3. *Refine & deploy the biogeophysical and social asset decision tools under development in the NARA project to aid in facility implementation and adoption decisions*

- *BGP Assets – Natalie Martinkus & Mike Wolcott*
- *Social Assets - Sanne Rijkhoff, Season Hoard, Mike Gaffney, Wenping Shi, Nicholas Lovrich, John Pierce & Paul Smith*

Long Term; Social Assets - Develop a robust CAAM with applications to various geographic regions.

Near Term; **Social Assets** - Develop a working Community Asset Assessment Model (CAAM) – based on social asset analysis - as a quantitative decision tool to aid in AJF implementation decisions for the NARA region; ground-truth the model (primary data); define a “Midwestern” region, then begin measure selection and weighting using regional retrospective case research

4.3. Utility of Community Asset Assessment & Modelling

- Understand the social components contributing to support or opposition to projects necessary to bring AJF into the aviation fuel supply chain
  - Community social characteristics can significantly impact project development, implementation and success – positively or negatively
- Social components are traditionally undervalued and under-assessed
  - Apply mature NARA CAAM model to assess community characteristics
  - Predict community cohesion and support for critical implementation

CAAM Model

Phase III: (ASCENT) Testing and Refinement

- Further statistical testing
- Expanded applications
- Case-study validation

Next Steps: Case Study Validation

- Chippewa County, Michigan

Mascoma Corporation- Kinross Ethanol Plant

2008

December 2008: Proposal to build a biorefinery with 20 mil gallon capacity on a 50-acre site in Chippewa County, Michigan. Feedstock is primarily woody biomass. Mascoma Corp joined a local timber and mining company, J.M Longyear, to form Frontier Renewable Resources. Construction was expected to be done in 2013 and operations will begin mid 2014

2011

February 2011: The Department of Energy (DOE) released a DRAFT EA & Notice of Wetland Involvement for the Construction and Operation of a Proposed Cellulosic Biorefinery, Mascoma Corporation, Kinross Charter Township, Michigan.

2011: Sierra Club submitted comments to DOE and the Senator of Michigan on the Draft Environmental Assessment

December 2011: Larry Klein and Sierra Club filed a lawsuit against the project claiming that the government did not examine all the potential environmental impacts, case number 2:11-cv-00514

Mascoma received $12.1 million from Michigan Strategic Fund (MSF).

Valero Energy Corp announces agreement with Mascoma to take on the financing of construction and start-up of the cellulosic ethanol plant.

2012

2012: Construction of the ethanol plant was supposed to start

December 2012: A federal judge ruled that Sierra Club lacks standing to sue the DOE, and found that the department had complied with NEPA in all aspects and that its actions were not arbitrary.

2013

August 2013: Valero Energy backs out of Mascoma's proposal, and Mascoma says it is actively seeing project financing.

2014

January 2014: Larry Klein and Sierra Club appealed the case filed in 2011 after the district court ruled in favor of the DOE. Court ruling said that the environmental assessment by DOE was thorough and reasonable.

July 2014: Mascoma decided to go in a new direction and isn't likely to build the Kinross plant, according to Bill Brady, president and CEO of the company. The company faced challenges in the form of current federal policy and the inability to get strategic investors to fully commit.

December 2014: Mascoma sells its name, trademarks, patented yeast strains and technology to Lallemand Inc., a Canadian yeast marketing and developing company

- N Manchester, Indiana

Poet Biorefining (North Manchester, IN)

2007

April 2007: The Environmental Protection Agency (EPA) issued a rule including ethanol production facilities to being classified as chemical plants, raising their annual emissions limits from 100 tons to 250 tons.

2008

September 2008: POET Biorefining- North Manchester began operations, consuming approximately 24 million bushels of locally-grown corn to annually produce about 68 million

2010

May 2010: The Indiana Department of Environmental Management (IDEM) issued an operating permit to POET allowing the facility to emit pollutants up to 250 tons per year before PSD review would be triggered.

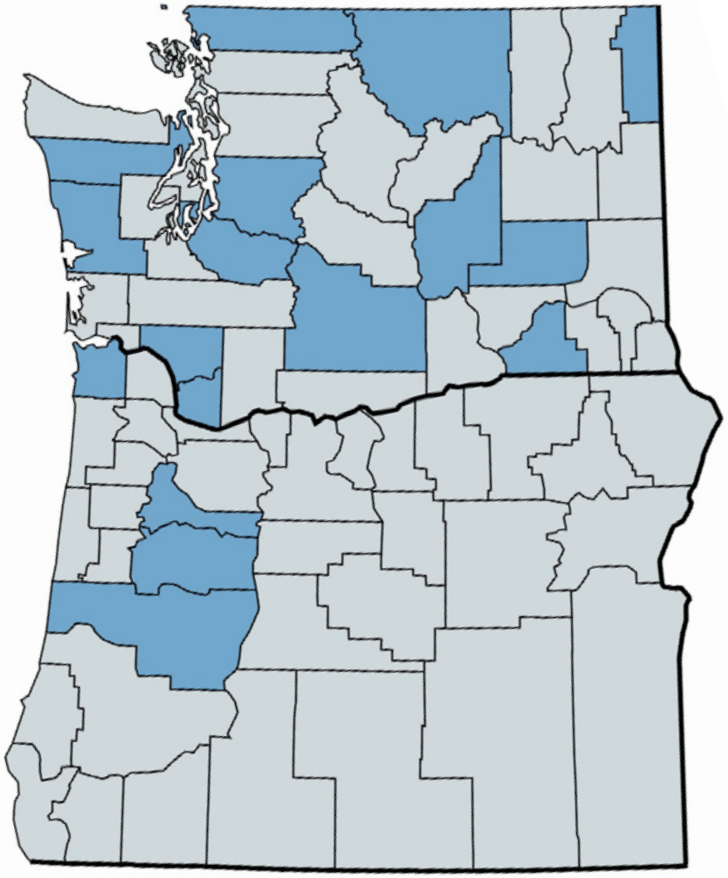
2011

January 2011: The National Resources Defense Council (NRDC) sought administrative review of the permit issued, claiming that the ethanol facilities do not classify as chemical plants and annual emissions should not exceed 100 tons per year. NRDC claimed that Indiana's SIP

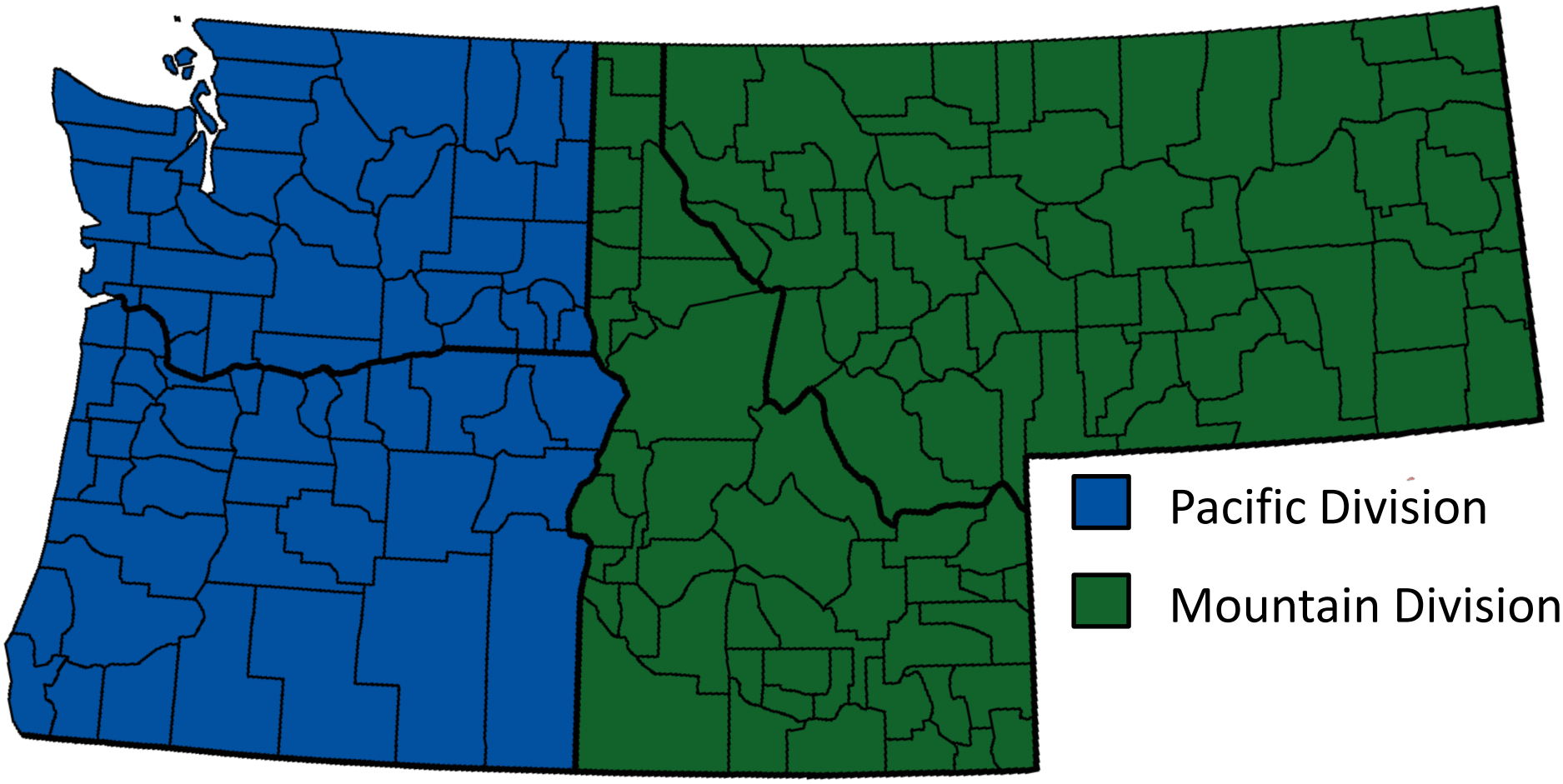
January 2011: The OEA issued findings agreed with NRDC and vacated the permit issued to POET, and did not approve any further permits for facilities unless they identified the ethanol plant as major emitting facilities.

2013

County-Level Comparison



Census Divisions

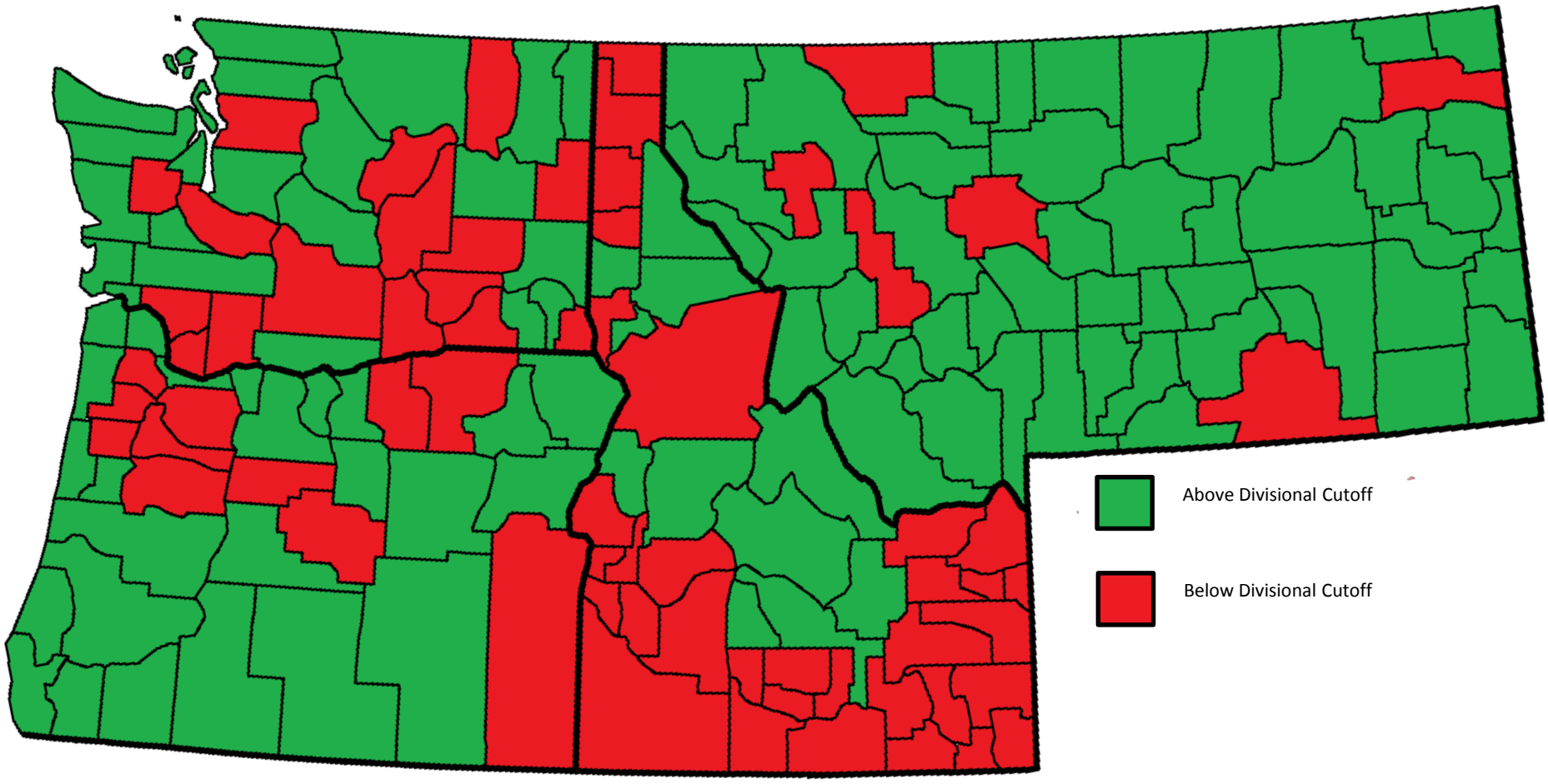


NARA

Social Capital 2009

Pacific Cutoff: .3522

Mountain Cutoff: .2295



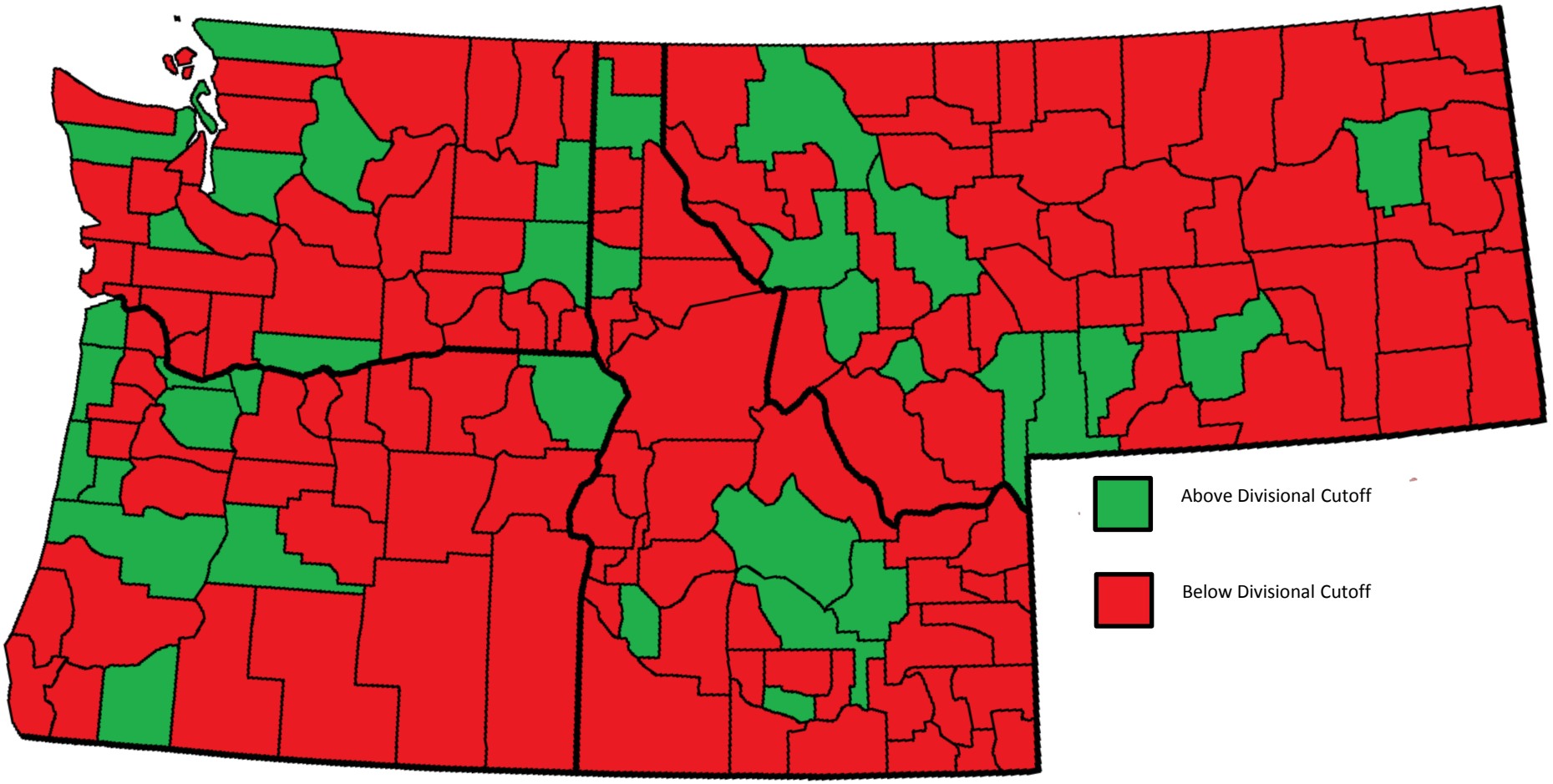
Social Capital | CVI | Health | Obesity | Poverty | Education | Language

NARA

Cultural Vitality Index 2010

Pacific Cutoff: .691

Mountain Cutoff: .684



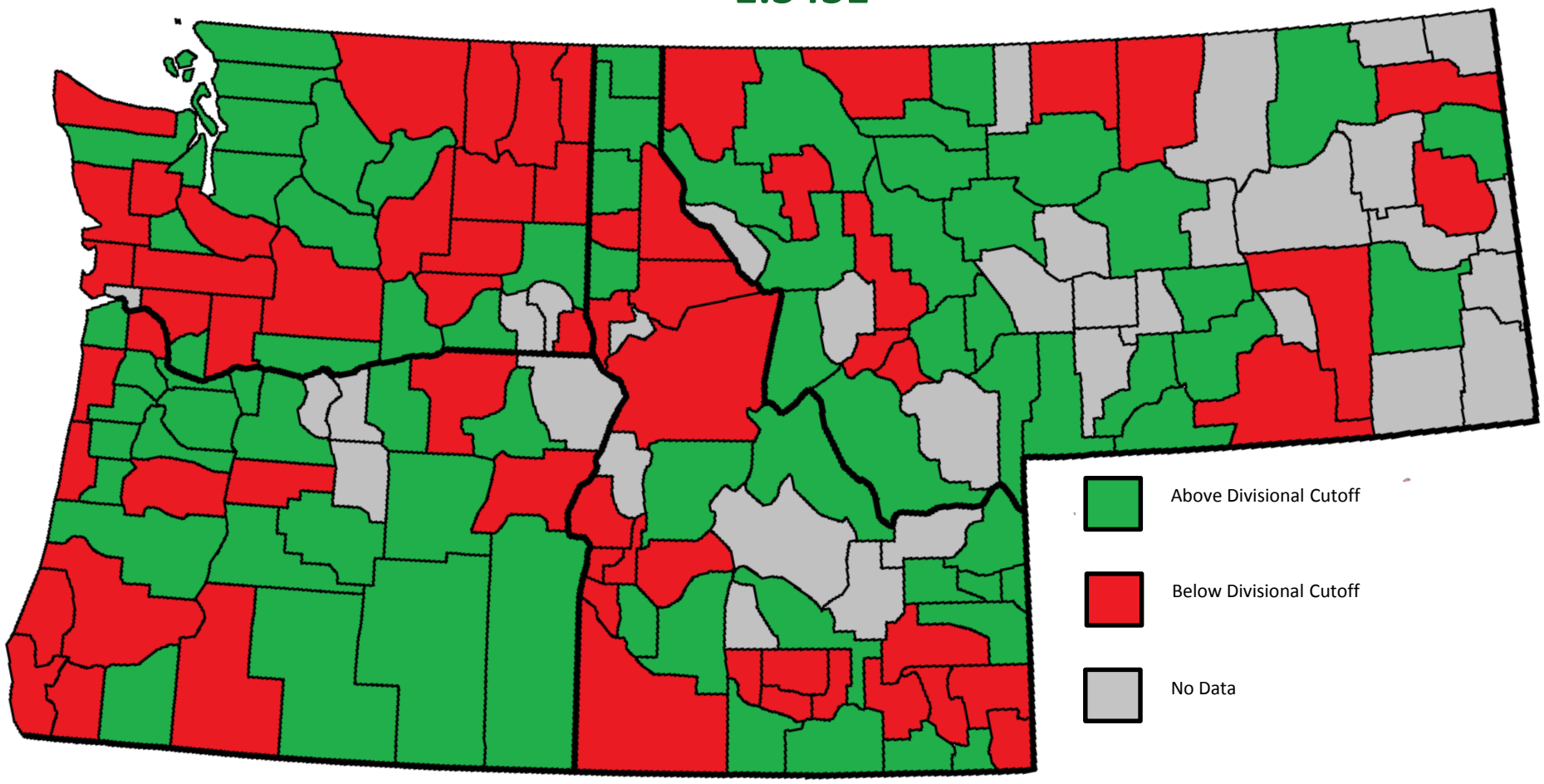
Social Capital | CVI | Health | Obesity | Poverty | Education | Language

NARA

Health 2013

Pacific Cutoff: 1.5554

Mountain Cutoff: -1.3431

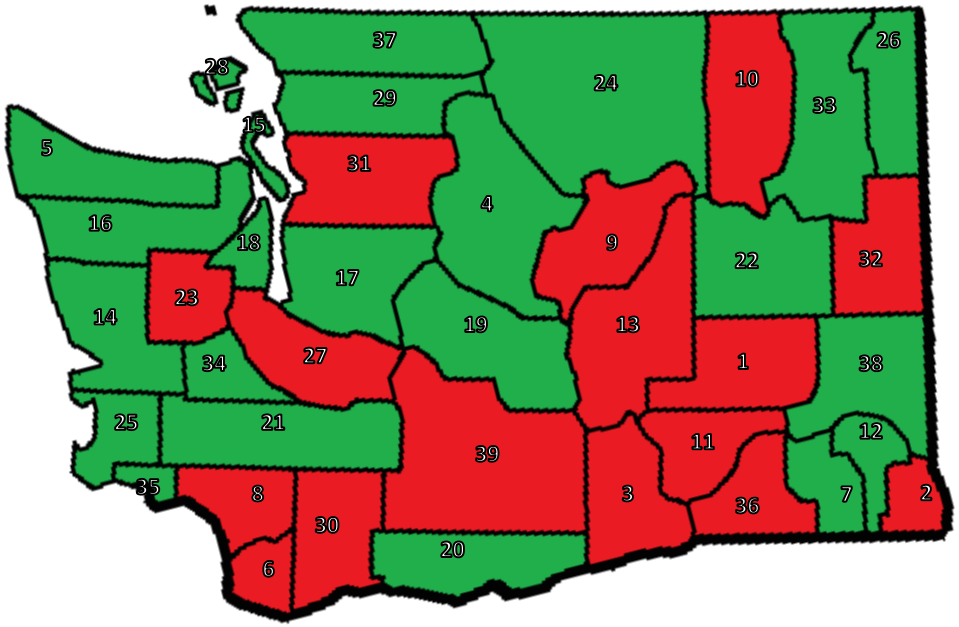


Social Capital | CVI | Health | Obesity | Poverty | Education | Language

NARA

Washington Social Capital 2009

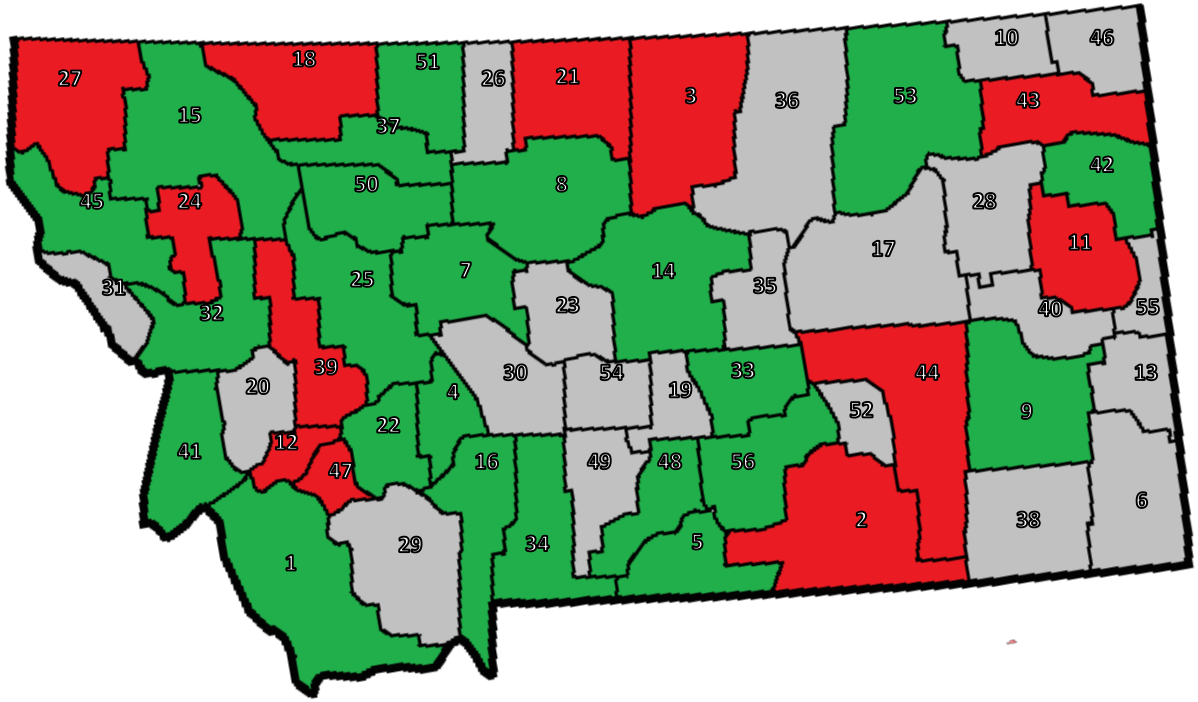
	County	Cutoff -.3522
1	Adams	-0.22
2	Asotin	-0.10
3	Benton	-0.31
4	Chelan	0.62
5	Clallam	0.52
6	Clark	-0.94
7	Columbia	1.90
8	Cowlitz	-0.31
9	Douglas	-0.87
10	Ferry	-0.07
11	Franklin	-1.79
12	Garfield	3.19
13	Grant	-0.94
14	Grays Harbor	0.06
15	Island	0.07
16	Jefferson	1.83
17	King	0.07
18	Kitsap	0.06
19	Kittitas	0.04
20	Klickitat	0.68
21	Lewis	0.12
22	Lincoln	3.47
23	Mason	-0.43
24	Okanogan	0.31
25	Pacific	1.53
26	Pend Oreille	0.47
27	Pierce	-0.75
28	San Juan	3.88
29	Skagit	0.05
30	Skamania	-0.31
31	Snohomish	-0.56
32	Spokane	-0.23
33	Stevens	0.69
34	Thurston	0.10
35	Wahkiakum	0.48
36	Walla Walla	-0.21
37	Whatcom	0.26
38	Whitman	0.12
39	Yakima	-1.11

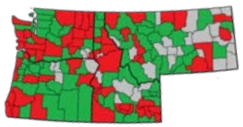


NARA

Montana Health 2013

	County	Cutoff -1.3431
1	Beaverhead	-1.73
2	Big Horn	4.22
3	Blaine	4.12
4	Broadwater	-0.65
5	Carbon	-1.88
6	Carter	---
7	Cascade	-0.07
8	Chouteau	-0.93
9	Custer	-0.76
10	Daniels	---
11	Dawson	0.25
12	Deer Lodge	4.05
13	Fallon	---
14	Fergus	-2.11
15	Flathead	-1.78
16	Gallatin	-4.84
17	Garfield	---
18	Glacier	5.23
19	Golden Valley	---
20	Granite	---
21	Hill	1.51
22	Jefferson	-1.49
23	Judith Basin	---
24	Lake	1.14
25	Lewis and Clark	-0.59
26	Liberty	---
27	Lincoln	1.01
28	McCone	---
29	Madison	---
30	Meagher	---
31	Mineral	---
32	Missoula	-2.46
33	Musselshell	-1.43
34	Park	-1.62
35	Petroleum	---
36	Phillips	---
37	Pondera	-0.55
38	Powder River	---
39	Powell	1.00
40	Prairie	---
41	Ravalli	-1.35
42	Richland	-0.16
43	Roosevelt	5.86
44	Rosebud	2.88
45	Sanders	-0.23
46	Sheridan	---
47	Silver Bow	1.89
48	Stillwater	-1.13
49	Sweet Grass	---
50	Teton	-0.73
51	Toole	-1.78
52	Treasure	---
53	Valley	-0.70
54	Wheatland	---
55	Wibaux	---
56	Yellowstone	-0.33

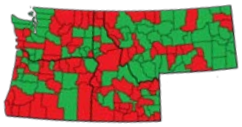


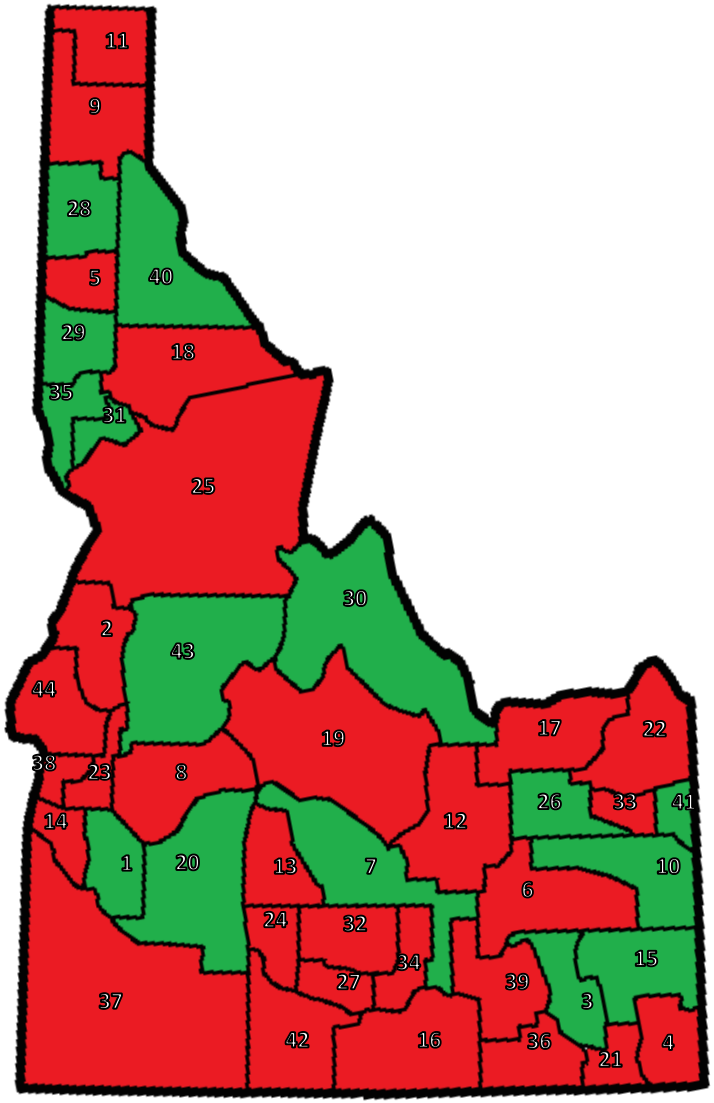


NARA

Idaho Education 2013

County	Cutoff 57.8
1 Ada	14.9
2 Adams	-4.0
3 Bannock	11.3
4 Bear Lake	-1.0
5 Benewah	-12.6
6 Bingham	-0.7
7 Blaine	8.5
8 Boise	-3.3
9 Bonner	-1.9
10 Bonneville	6.6
11 Boundary	-22.6
12 Butte	-6.8
13 Camas	-9.6
14 Canyon	-4.4
15 Caribou	5.6
16 Cassia	-9.6
17 Clark	-18.8
18 Clearwater	-7.0
19 Custer	-12.1
20 Elmore	3.1
21 Franklin	-9.1
22 Fremont	-9.9
23 Gem	-5.6
24 Gooding	-17.8
25 Idaho	-6.7
26 Jefferson	3.4
27 Jerome	-21.3
28 Kootenai	8.0
29 Latah	18.2
30 Lemhi	0.6
31 Lewis	2.3
32 Lincoln	-20.3
33 Madison	24.5
34 Minidoka	-20.1
35 Nez Perce	5.7
36 Oneida	-1.2
37 Owyhee	-25.2
38 Payette	-5.3
39 Power	-7.1
40 Shoshone	-10.1
41 Teton	9.8
42 Twin Falls	0.0
43 Valley	1.4
44 Washington	-10.3





NARA

CAAM Summary

- Demonstrates the predictive power of Social Assets to assess a community's capacity for collective action
  - **social capital, cultural capital (creative vitality), & human capital (health and education)**.
- More robust model is being applied to complex projects in the NARA region to aid determination of implementation potential.
  - Already applied in NARA WMC, currently being applied in MC2P and Columbia Plateau.
  - Next steps: apply to Midwest and other regions in the United States
- Data & methods move beyond biofuel siting decisions to analyze implementation potential of highly complex projects in the NARA region, the United States and potentially internationally.

Next Steps and Practical Applications:

Apply updated and robust measures of social assets (capital) to strategically inform implementation approaches to maximize project success; that is,

Tailor engagement strategies community collaboration projects to aid in not only identifying, but helping create receptive communities for AJF supply chain site selection and activities.

Refinery-to-Wing Assessment

- Phased design
- Key stakeholders
- Regional Sequencing
- Interview and Survey Inquiries
- Opportunities & Barriers related to SAJF adoption.

R-t-W Stakeholder Assessment

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Near Term:

- NARA Region – pilot with stakeholder populations and samples, pretest, & survey (interviews & questionnaires);
- Subsequent (Midwest?) Region – delineate the geographic parameters, develop SH populations/samples and survey instruments.

Long Term:

- Assess SH perceptions regarding the development of the SAJF industry and the adoption & diffusion of SAJF via qualitative and quantitative measures and analysis.

… toward a US – EU cross-national understanding of AJF industry barriers, logistical issues, requirements, & concerns among key stakeholder groups.

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I. Aviation Fuel Demand in the PNW Region

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Perspective: U.S. Petroleum and Jet Fuel Consumption

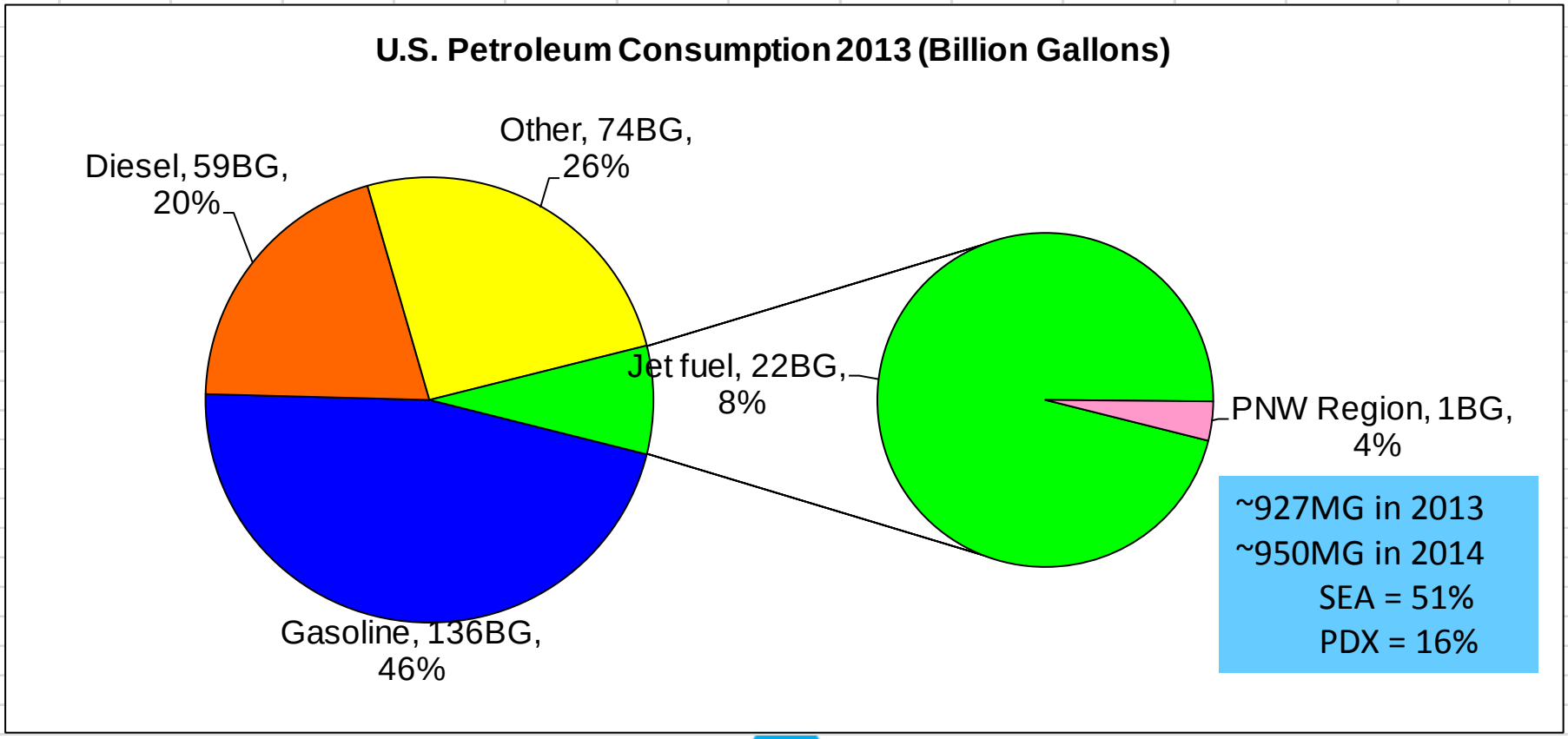

Figure 1. U.S. Petroleum Consumption and NARA's share of U.S. Jet Fuel in 2013 (EIA 2015a)

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PNW Region Demand by State (2013 = 927MG)

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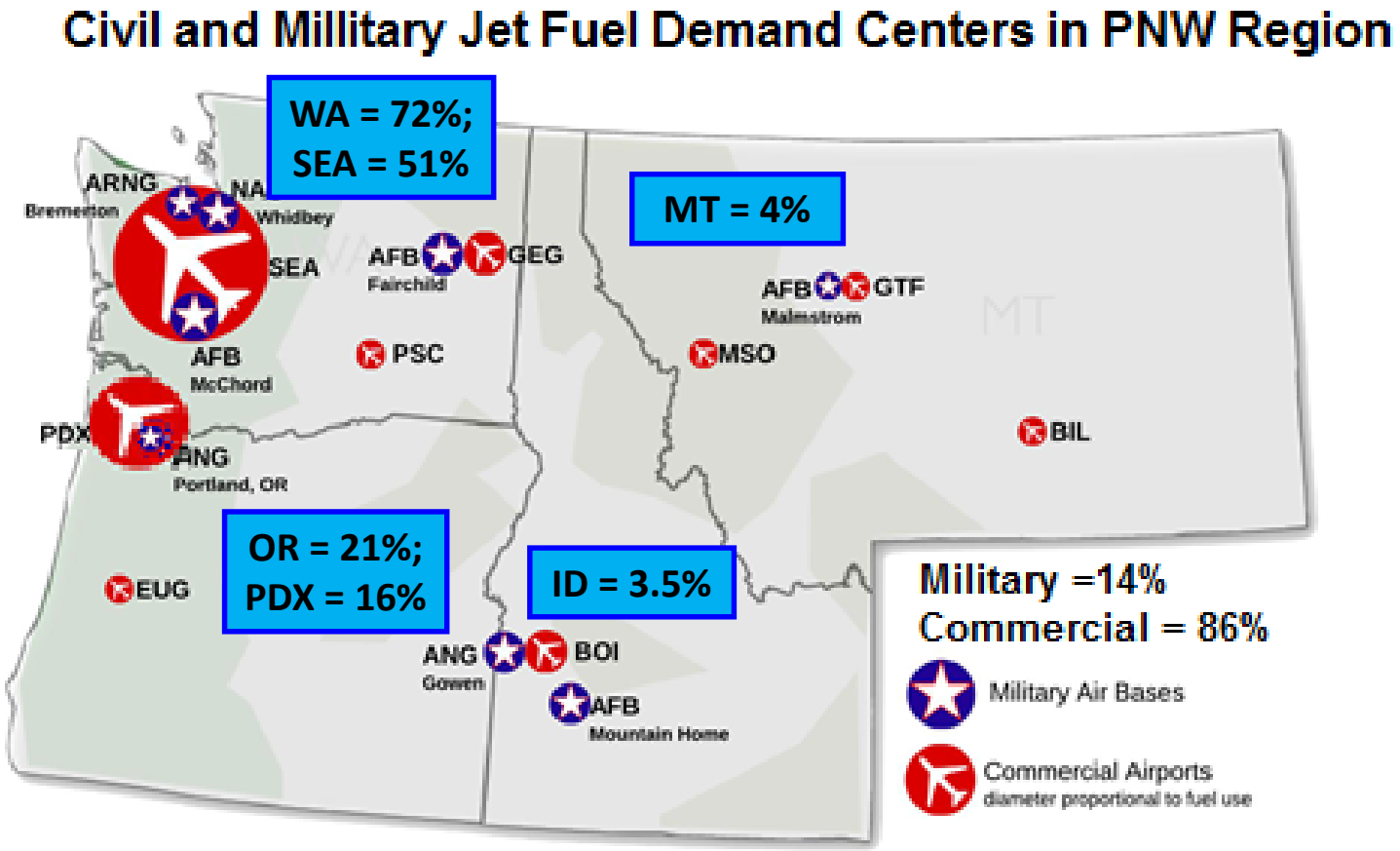

Data source: Military share is derived from SAFN 2011 Report; the state fuel consumption is from FAA

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II. Research Objectives

1. ID key aviation fuel supply chain SHs – U.S. PNW region;
2. Assess SH perceptions regarding the barriers/drivers to economically viable SAJF production in the NARA region;
3. Examine key issues to adding blended SAJF (ASTM D7566) into the ASTM D1655 Jet A fuel supply chain, including molecule tracking and crediting.

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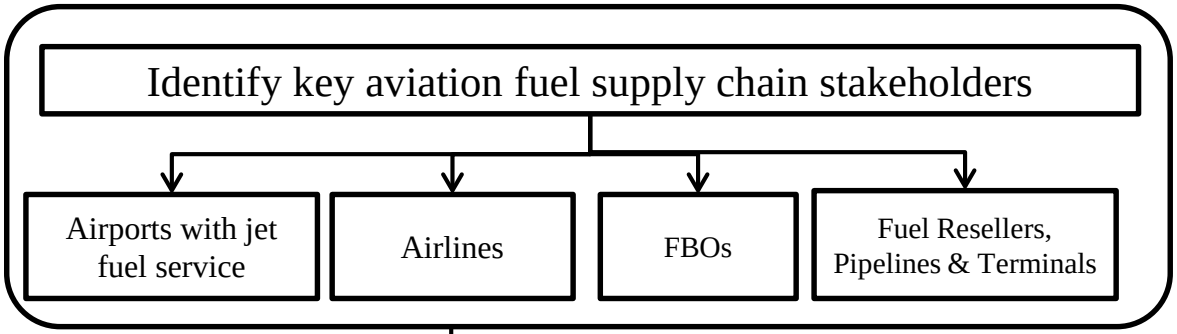
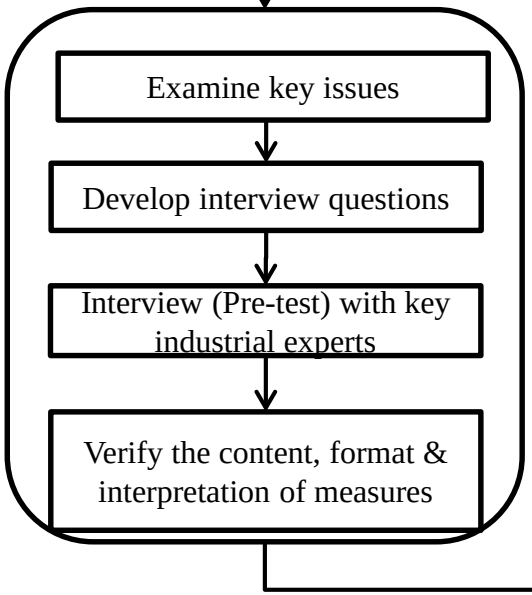
Research Design

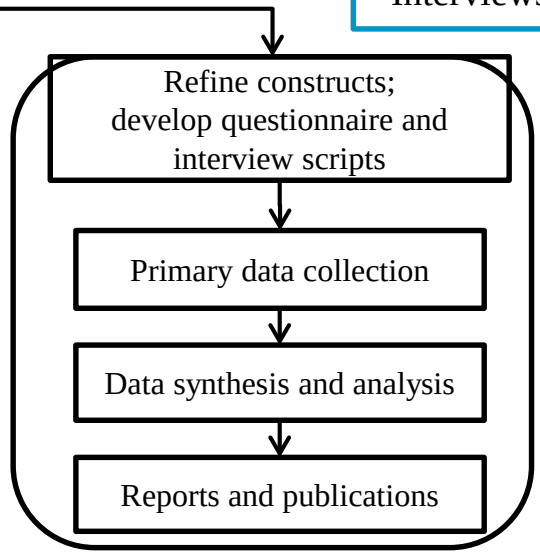
Phase I:
Secondary Data & Exploratory interviews – Population & issues



Phase II:
Construct development and verification



Phase III:
Primary Data Collection –Interviews & e-Surveys



III. Primary Data Collection Methods:

- **e-Surveys – Airport Mgrs. (n=70):**
  - 46% Response Rate (n=32)
  - Obtained key endorsements to increase RRs
  - Analysis in progress

- **In-Depth Interviews**
  - On-Site by Appt., June-Oct., recorded & transcribed
  - Airport Mgrs., FBOs, Fuel Resellers, Pipelines, Terminals & Airlines
  - In-progress (n=24 to date)

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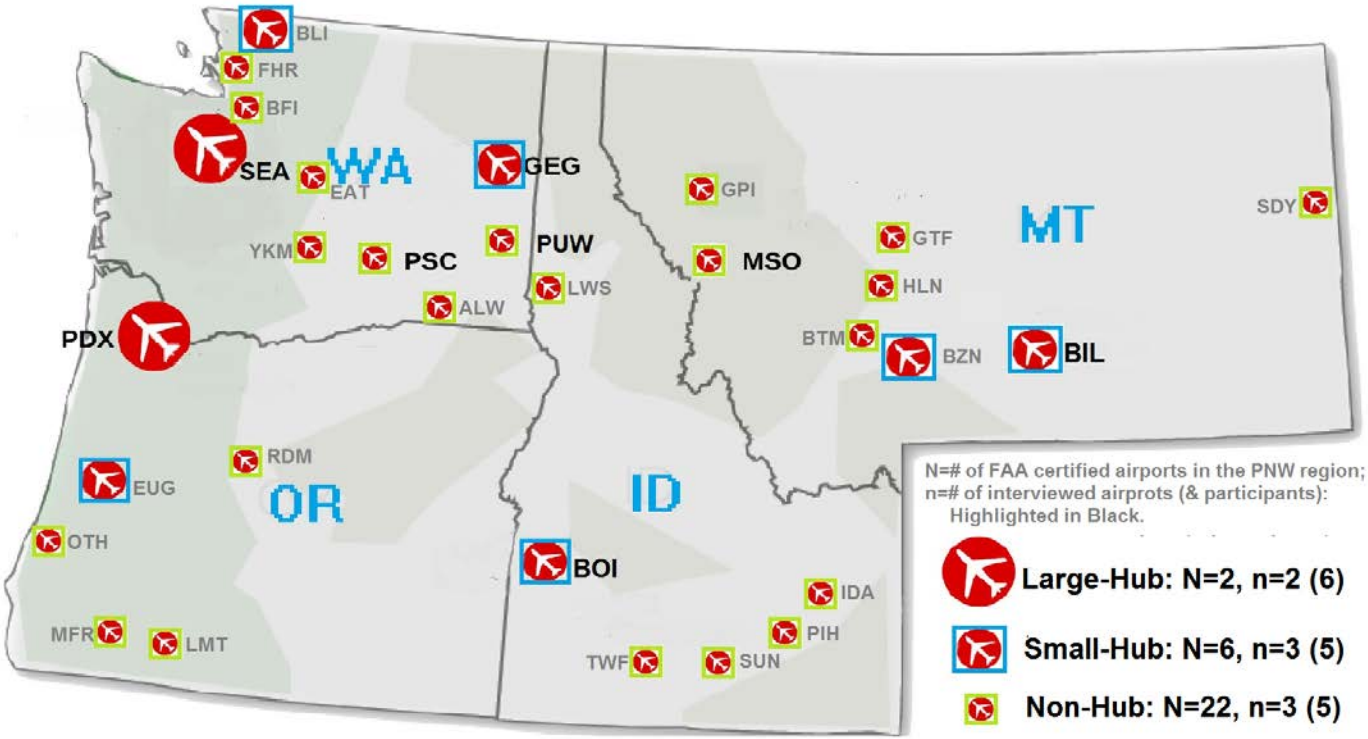
Distribution of Interview Respondents



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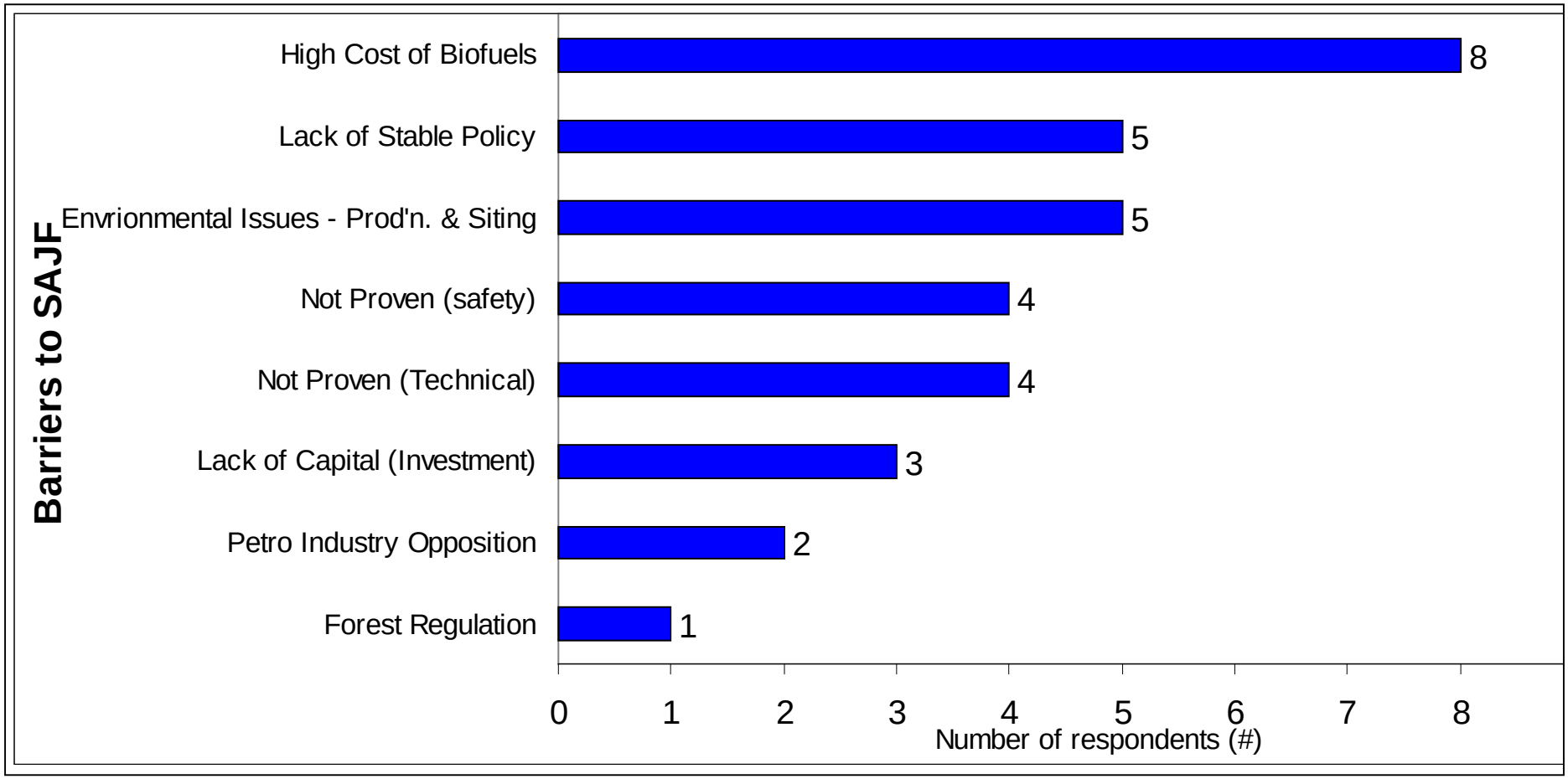
IV. Preliminary Findings: Barriers to Regional SAJF

*Q. What are the **key barriers** to developing an economically viable SAJF production industry in the Pacific Northwest region?*



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Barriers to Regional SAJF

"The biggest impediment [to SJF production] would be price 'parity' with petro-jet fuel in terms of production, supply chain, storage, compatibility to the engines, plus any potential credits."

*"There is not **policy stability** or harmony for (S)AJF. In contrast, on-road fuels have better incentives for renewable fuel than jet fuel."*

*"**Siting refineries** is a contentious issue with environmentalists, particularly new greenfield sites. Brownfield siting or co-siting with existing mfg. may be the answer."*

*"**Safety** is a paramount concern in this industry."*

*"Rules must address **pipeline interface issues** to transport SJF in pipelines. For example, the interface may include up to 500 barrels which must be cleaned (filtered). And, at the terminal/fuel farm, plumbing, filtering, and blending will require capital for dedicated (neat or blended) SJF storage."*

*"The **forest is over-regulated**. We can't sit and watch thousands of acres of natural resources burn. It (SAJF) is a great use of the biomass."*

Barriers to Regional SAJF

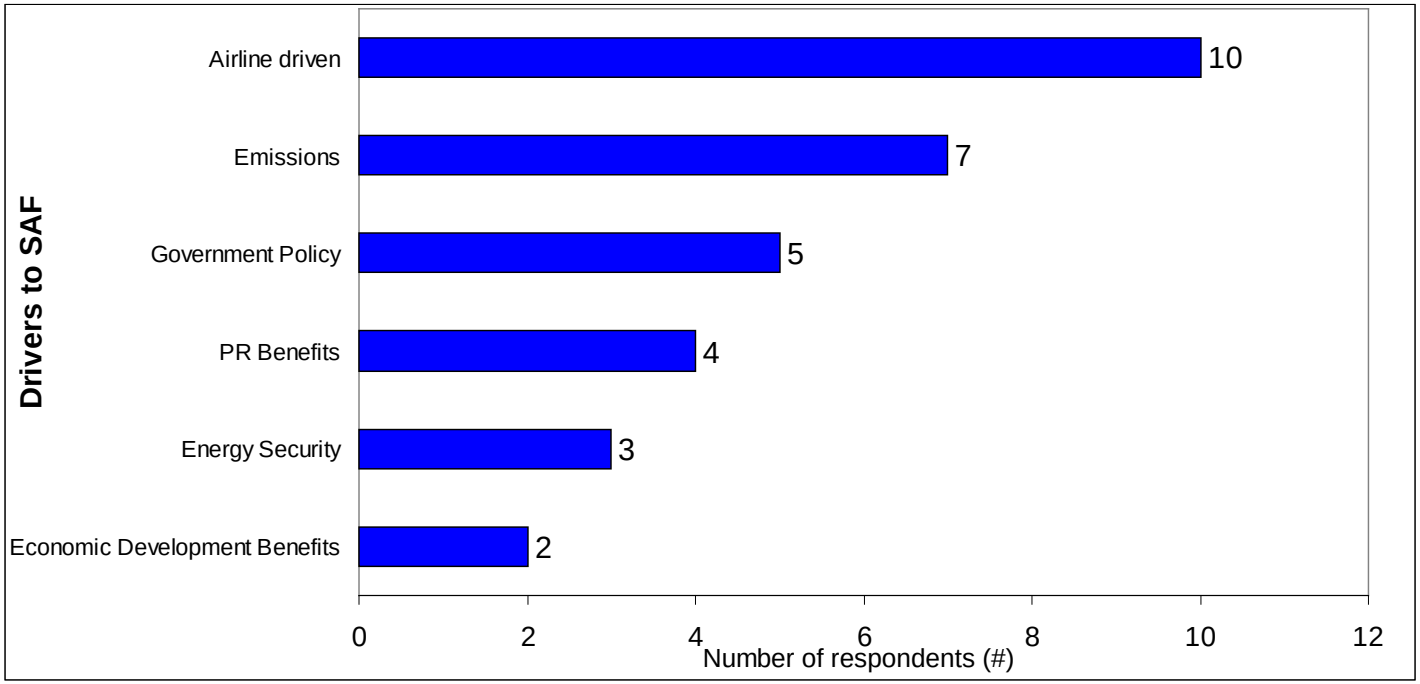
"With a few exceptions, fuel handlers do not have an aviation fuel mindset and proper SJF logistics from refinery-to-wing, including blending with conventional Jet A, requires expertise & experience."

"The most important barriers include certification, testing, and validation (quality assurance) of SJF. It must be 100% effective 100% of the time. The existing petro-focused safety, quality assurance, and distribution issues must be met by SJF."

"A [SJF] study should be conducted to examine pipeline flow, residues and stickiness left in the pipelines, filtration requirements (from SJF in the pipelines] and other potential SJF contaminants."

Drivers

Participants' views regarding the drivers to SAF development in the U.S. PNW region.



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Future Work

- **Pilot – PNW Region**
  - Complete primary data collection
  - Analysis & reports
  - Pub(s).: *J. of Air Transport Mgmt.* & *Biomass & Bioenergy*

- **Years 2 & 3 – Expand to other U.S. region(s)**
  - Develop populations & samples - airport mgrs. & fuel handling
  - Refine and verify constructs
  - Primary data collection

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Research Challenges

- Identifying key contacts (participants)
  - Directories, websites, & pre-notification phone calls
- Response rates - cooperation regarding potentially sensitive (competitive/political) issues
  - Engage participants via social exchange theory – intrinsic rewards, costs, trust... (expert endorsements)
  - Content and ordering of questions
  - Develop relatively benign, meaningful & interpretable questions
  - Thorough pretesting

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Thank You

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Questions?

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USDA NIFA United States Department of Agriculture National Institute of Food and Agriculture