



Community Asset and Attribute Modeling: Applying Social Data to Inform Bio-Fuel Project Site Selection in the NARA Region



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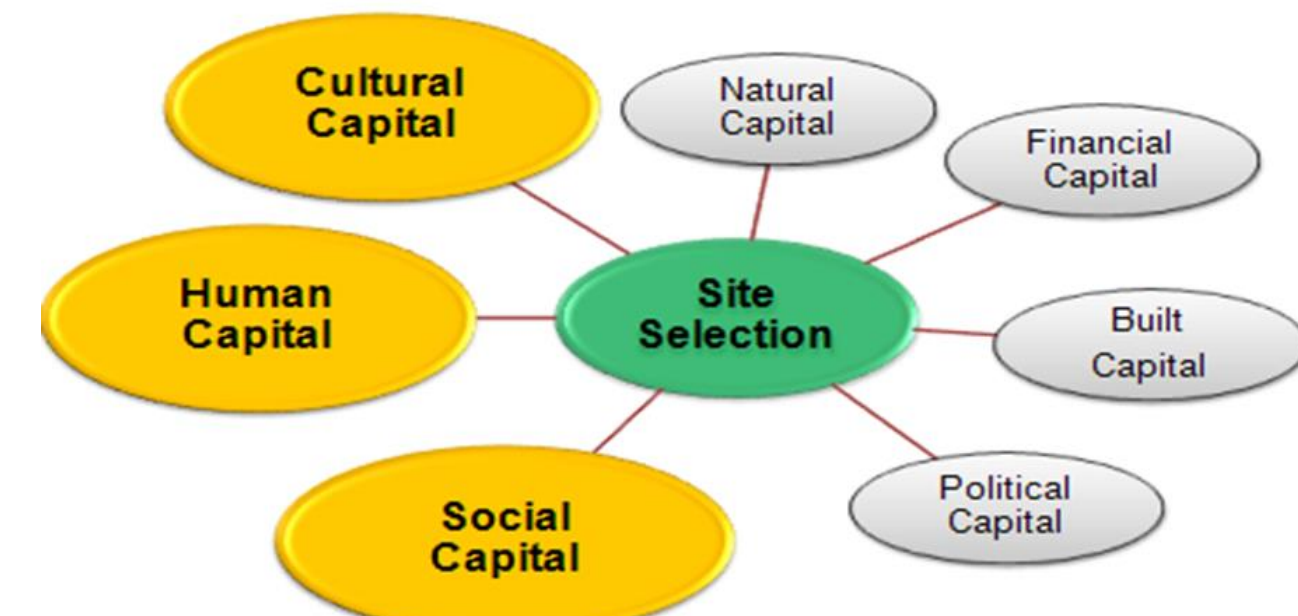
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1 Introduction

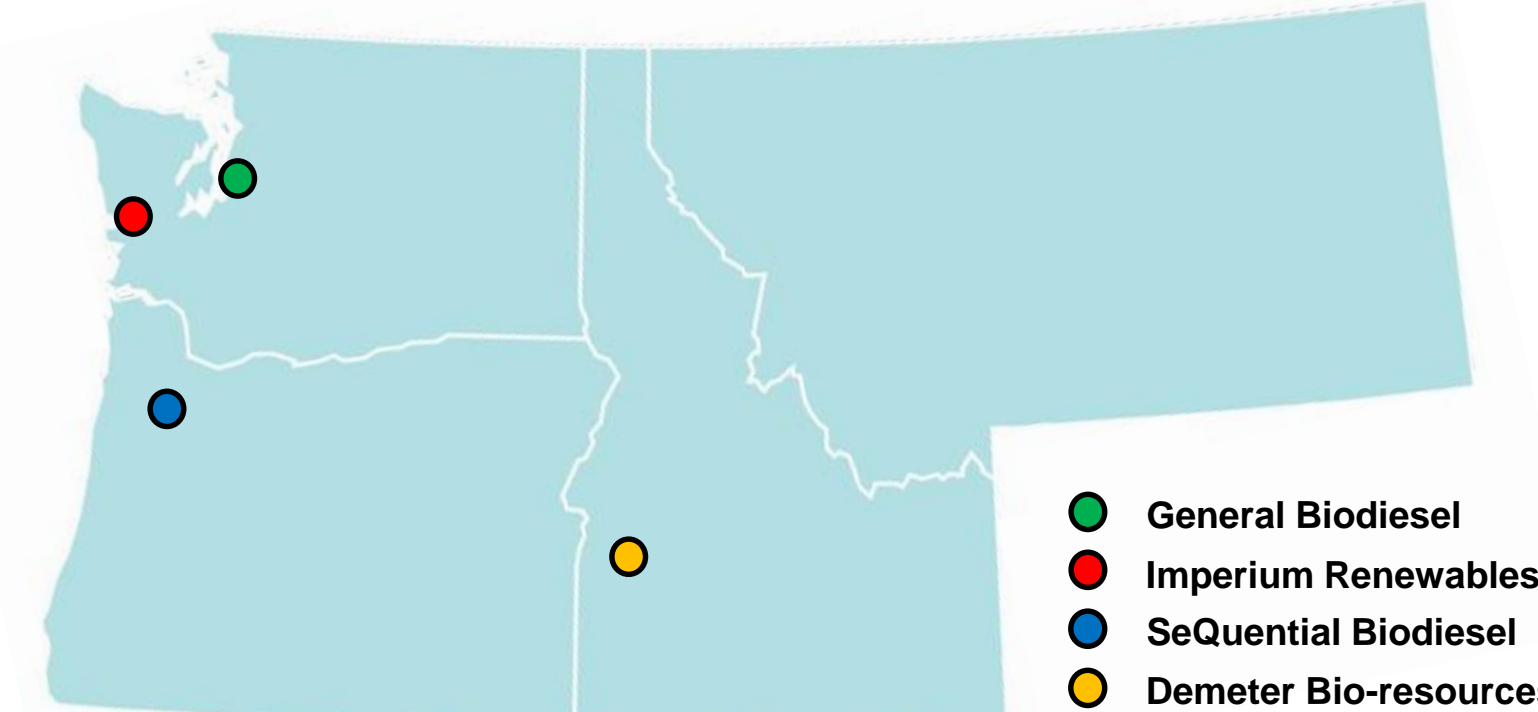
Social assets are important components of site-selection that can significantly bolster or hinder implementation success, yet they are often not included in site-selection decisions. We argue that social assets in combination with biogeophysical and other resources are important for successful site-selection, utilizing the Community Capitals Framework (CFF) to elaborate these important assets. We build on previous work of Rijkhoff et al. (n.d.) by refining our social asset benchmarks using Census divisions to determine cut-offs and test the validity of these measures using case studies in the NARA Region. These benchmarks are then combined with newly updated Biogeophysical measures to identify potential communities for biofuel facilities in the MC2P region. We argue that this refined framework will aid site-selection by identifying communities with the necessary resources to increase the likelihood of economic success.

2 Background and Framework

The Community Capitals Framework



Case Study Locations



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.

3 Methodology

The community capitals framework provides significant insight into the successful site selection for biofuel activities beyond the biogeophysical assets of these communities. This study builds on Rijkhoff et al. (n.d.) which used various national datasets (Rupasingha et al., (2006), WESTAF and the County Health Rankings) to analyze county-levels of social capital, cultural capital, and human capital, by applying their asset benchmarks in the MC2P and Columbia Plateau. The measures utilized in this study and the previous exploratory analysis are included in Table 1 below. We refine the benchmark measures created by Rijkhoff et al. (n.d.) by using division averages, rather than Census regions, to create benchmark measures for comparing community assets. We examine the validity of these measures utilizing case study analysis of implementation of alternative fuel facilities in these regions to analyze their ability to predict or explain success. Following the case study validation, we combine these assets with a refined biogeophysical analysis conducted by Martinkus et al. (n.d.) to identify communities in the NARA region for potential site-selection for biofuel activities.

TABLE 1: Measures used in current study

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

4 Case Study Validation

In order to evaluate the validity of our measures as partial explanations of success, we conduct case study analysis of alternative fuel facilities in the NARA Region. We selected 4 case studies of refineries in the region: General Biodiesel, Imperium Renewables, SeQuential Biodiesel, and Demeter Bio-resources. Two of these case studies, General Biodiesel and SeQuential Biodiesel, are successful, while two facilities are failures or partial failures, Demeter Bio-resources and Imperium Renewables. In order to determine success or failure, we analyzed whether refineries were operating continuously, whether they encountered economic or legal roadblocks that significantly impacted their operation, whether they were forced to add crude oil refinement to their operation to stay viable, and, whether they were even constructed or forced to shut down in the face of local resistance or economic problems. Successful cases showed continuous operation of primarily biofuel production with few to no legal or economic roadblocks, while cases where refineries were planned but never built or ultimately shut down are ranked as outright failures. Partial success and failure are dependent upon economic and legal roadblocks refineries faced and to what degree this affected their operation.

Table 2 below illustrates that the measures are somewhat successful in explaining success, although they are not perfect predictors. The measures are able to explain the clear case of success (General Biodiesel), the clear case of failure (Demeter), and the partial failure. However, they do not seem to explain the success of SeQuential Biodiesel. This is likely because the measures only capture three capitals. It may very well be the case that success is possible in places with low social, human, and cultural capitals due to other capitals, such as the financial or political, playing a more important role in those areas. We argue that these assets increase the likelihood of success rather than the sole explanation of success or failure.

TABLE 2: Preliminary Case Study Validation

	General Biodiesel King ^a WA	Imperium Renewables Grays Harbor ^a WA	SeQuential Biodiesel Marion ^a OR	Demeter Bio-resources Canyon ^b ID
Soc. Cap. 2005	0.15	0.02	-0.21	-2.13
Soc. Cap. 2009	0.07	0.06	-0.4	-2.05
CVI 2009	1.37	-0.349	0.011	-0.321
CVI 2010	1.45	-0.383	-0.047	-0.346
Health 2013	-2.96	3.04	-0.33	0.51
Obesity 2013	-4.8	5.7	3.2	4.5
Poverty 2013	-2.71	1.4	0.66	1.89
Education 2013	18.9	-7.5	-7	-4.4
Language 2013	0.4	-2.3	3	2.6
Outcome	S	F	S	F

Note: County values are presented as differences between the county score and each county's respective divisional cutoff. 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 divisions Pacific and Mountain (US census divisions) over 165 and 281 counties, respectively. For social capital and CVI scores data from Alaska and Hawaii is missing. See tables A6 through A11 for averages for other regions.

^a: counties in the Pacific Division
^b: counties in the Mountain Division

Following the case study validation, the social asset measures were combined with new Biogeophysical analysis conducted by Martinkus et al. (n.d.) to identify potential communities for sight selection in the MC2P and WMC regions. The updated biogeophysical analysis includes NARA's new goals of retrofitting existing facilities to identify communities with adequate resources to be considered for site-selection. We combine our social asset measures with this updated framework to identify communities with the necessary biogeophysical and social assets to be considered for site-selection.

5 Analysis Results

Table 2: Case Analysis of Social Capital, Cultural Capital and Human Capital

Variable	Cascades to Pacific								Western Montana Corridor			
	Cowlitz ^a WA	Pierce ^a WA	Clark ^a WA	Jefferson ^a WA	Grays Harbor ^a WA	Clatsop ^a OR	Lane ^a OR	Linn ^a OR	Walla Walla ^a WA	Pend Oreille ^a WA	Nez Perce ^b ID	Missoula ^b MT
Soc. Cap. 2005	-0.22	-0.7	-0.96	2.02	0.02	1.48	0.57	0.32	-0.23	0.76	-0.29	1.9
Soc. Cap. 2009	-0.31	-0.75	-0.94	1.83	0.06	1	0.2	-0.1	-0.21	0.47	-0.31	1.65
CVI 2009	-0.366	-0.06	-0.06	0.696	-0.349	0.27	0.23	-0.4	-0.117	-0.463	-0.112	0.957
CVI 2010	-0.36	-0.036	-0.09	0.814	-0.383	0.294	0.27	-0.4	-0.001	-0.429	-0.158	0.948
Health 2013	3.22	0.64	-0.84	-0.89	3.04	-1.06	-0.06	0.85	-0.69	1.46	0.56	-2.46
Obesity 2013	9.8	3.8	1.9	-2.3	5.7	-1.3	-0.1	1.9	1.4	3.6	5.6	-4.4
Poverty 2013	0.76	-1.37	-0.84	-0.52	1.4	0.1	-0.12	0.62	-0.76	1.19	-1.1	-0.77
Education 2013	1.3	3.4	6.2	7	-7.5	0.003	8.1	0.9	2.9	-6.9	5.7	16.2
Language 2013	-3.2	-1.9	-1.8	-4.3	-2.3	-2.7	-3.2	-3.4	0.6	-4	-2.1	-2

Note: County values are presented as differences between the county score and each county's respective divisional cutoff. 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 divisions Pacific and Mountain (US census divisions) over 165 and 281 counties, respectively. For social capital and CVI scores data from Alaska and Hawaii is missing. See tables A6 through A11 for averages for other regions.

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6 Conclusions

Combining the social assets analysis with the biogeophysical analysis conducted by Martinkus et al., (n.d.), this study identifies 4 counties in the NARA WMC and C2P regions that have the necessary capitals to be considered for site-selection (Jefferson, WA; Clatsop, OR; Lane, OR; Missoula, MT). The combination of biogeophysical and social assets suggests that these communities will be more likely to succeed when implementing biofuel production.

This study asserts that social capital, human capital and cultural capital, while not perfect predictors on their own, cannot be excluded from site-selection decisions. However, many of these important decisions are made without considering these necessary community resources. These assets contribute to a higher likelihood of success for the implementation of complex projects. While success may occur when these assets are absent, overcoming these limitations can be costly and considerably delay biofuel production. These benchmark measures are a very important tool that, in concert with more traditional decision factors, will aid site-selection decisions for aviation biofuels and other highly technical projects. It should also be noted that political capital is an important component of success not incorporated into the current study. As stated, all capitals are necessary and when present will contribute to the likelihood of success.

Currently, the model and the benchmark measures have been employed most frequently in the WMC and C2P. Future analysis will include refining the model for the rest of the NARA region.

References

County Health Rankings and Roadmaps. Updated 2013. Cited 2014 April 5, County Health Rankings National Data. *The Robert Wood Johnson Foundation and the University of Wisconsin Population Health Institute*. Available at: <http://www.countyhealthrankings.org/>.

Emery, M. and Flora, C. 2006. "Spiraling Up: Mapping Community Transformation with the Community Capitals Framework", *Journal of Community Development Society*, 37, pp. 19-35.

Martinkus, N., Shi, W., Lovrich, N., Pierce, J., Smith, P. and Wolcott, M. 2014. "Integrating Biogeophysical and Social Assets into Biomass-to-Biofuel Supply Chain Siting Decisions", *Biomass and Bioenergy*, 66, pp. 410-418.

Martinkus, N., Rijkhoff, S., Shi, W., Hoard, S., Smith, P., Gaffney, M. (n.d.). "Biophysical and Social Asset Integration in biofuel production: refining measures to increase the likelihood of success." *To be submitted to Biomass and Bioenergy*, October 2015.

Rupasingha, A., Goetz, S.J., and Freshwater, D. 2006. "The Production of Social Capital in US Counties", *The Journal of Socio-Economics*, 35, pp. 83-101.

Western States Arts Federation c2010, cited 2014 April 5. "The Creative VitalitySM Index: An Overview", Available at: http://www.westaf.org/publications_and_research/cvi