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Prime Recipient Name: Los Angeles Cleantech Incubator (LACI)
Project Title: Energize California (formerly Los Angeles Regional Energy Innovation Cluster (LA REIC))
Submission Date: October 9, 2017
Deliverable 2.3: Baseline Disadvantaged Community Report #1
Deliverable 2.3: Disadvantaged Community Update Report #1

Disadvantaged Community Update Report #1

Although there is no specific mandate in the Energy Commission's grant to the Los Angeles Regional Energy Innovation Cluster (Energize California) to deploy clean energy technologies in Disadvantaged Communities, LACI and our grant partners are committed to using Energize California's community outreach, tech scouting, and pilot facilitation program activities to support clean energy adoption and deployment throughout Disadvantaged Communities in the broader Los Angeles region.

While preparing the original Energy Commission grant proposal, the Energize California proposal team discovered that the CalEnviroscreen designation of a Disadvantaged Community, while a good way to determine the pollution burden in a community, was often not granular enough to accurately describe the "on the ground" conditions in a community. In some cases, CalEnviroscreen fails to take into consideration key social, economic and environmental conditions that contribute to community inequities.

In addition, feedback shared from Disadvantaged Communities themselves clearly indicates that the lack of outreach coordination among the State of California's state agencies (ex: Energy Commission, Department of Water Resources, Cal-EPA, etc.) results in a fragmented and confusing web of relationships and resources for communities. State agencies – each with its own regulatory framework and definition of a "disadvantaged community" – have different perspectives and definitions of which communities are most vulnerable. Thus, California has ended up with a statewide, multi-layered patchwork of "vulnerable communities" with each patch defined by different social, economic and environmental thresholds and each with its own set of communication and outreach channels and protocols.

Since Energize California is a regional effort, we have determined that in order to drive impact, improve efficiencies and maximize the social, economic and environmental benefit to our region's vulnerable communities, we needed a deeper understanding of the State's multiple "vulnerable community" definitions. Therefore, Energize California plans to assess the community-level data (and accompanying databases) to determine which communities an agency qualifies as "vulnerable". In

addition, the team will create a methodology that links these data, creating a holistic approach to determining which communities are at the highest risk. Finally, we hope to create a prioritization tool based on this new disadvantaged community assessment database and methodology that will allow us to help steer state and regional resources to the highest priority parts of the region.

Below is the first report, a combination of *Baseline Disadvantaged Community Report #1* and *Disadvantaged Community Update Report #1,* that describes Energize California's approach to researching, documenting, and prioritizing community engagement based on communities' social, economic, environmental characteristics and vulnerabilities according to a wide range of data sources.

LACI
FOR ENTREPRENEURS
BY ENTREPRENEURS

Energize California
Underserved Communities Assessment Database

Stage One: System Review

Report Produced in Collaboration With:
California State University, Dominguez Hills
California State University, Long Beach
California State University, Los Angeles
California State University, Northridge
California State Polytechnic University, Pomona
Water Resources and Policy Initiatives

Recent solar development in Compton, CA. http://shorebreakenergy.com/category/photography

Energize California: Underserved Communities Assessment Database

Stage One: System Review

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Introduction to Energize California

Launched in 2017, Energize California is an initiative of the Los Angeles Cleantech Incubator (LACI), and is part of the California Energy Commission's statewide Energy Innovation Ecosystem program.
Led by the Los Angeles Cleantech Incubator (LACI) in collaboration with 15 regional grant partners, Energize California is designed to support California's clean energy goals by connecting and convening the energy community, and helping promising clean energy startups access the critical business and technical resources they need to bring new technologies to market. We do this through a variety of activities including:

- Serving as Southern California's information hub for energy industry information, connections, and news
- Curating, hosting, and promoting industry events across the region
- Collaborating with partners to identify regional energy needs, pilot new technologies, and funnel energy innovation into Southern California, including underserved communities
- Stimulating and supporting entrepreneurship and economic development by facilitating collaboration, investment, and networking

Energize California's efforts are focused on a four-county area: Santa Barbara, Ventura, Los Angeles, and Orange Counties. A key objective for Energize California in this region is the engagement and support of Disadvantaged Communities and the Disadvantaged Communities Assessment Database project will help Energize California and our partners better understand the challenges facing our region's most vulnerable communities.

For more information, visit www.energize-ca.org.

Introduction to Energize California's Disadvantaged Communities Assessment Team

While preparing the original Energy Commission grant proposal, the Energize California proposal team determined that relying on CalEnviroscreen to identify Disadvantaged Communities, while a good way to determine the pollution burden in a community, was sometimes an incomplete or even misleading description of the "on the ground" conditions in a community. In addition, when examining the feedback from Disadvantaged Communities themselves, it was clear that the State of California's well-intentioned state agency interactions to support vulnerable communities were perceived as fragmented and confusing for community members. State agencies – each with its own regulatory framework and definition of a "disadvantaged community" – have different perspectives on what constitutes a vulnerable community and how they would prefer to engage with that community. Thus, California has ended up with a statewide, multi-layered patchwork of "vulnerable communities" with each patch defined by different social, economic and environmental thresholds and each with its own set of communication and outreach channels and protocols.

In order to catalogue a comprehensive overview of community data resources and develop an assessment and prioritization methodology, Energize California is relying on the CSU5, which consists of the five Los Angeles County California State University (CSU) campuses: California State University, Dominguez Hills; California State University, Long Beach; California State University, Los Angeles; California State University, Northridge; and California State Polytechnic University, Pomona. The CSU5 have partnered with the CSU Water Resources Policy Institute (WRPI), a CSU system-wide institute working at all 23 of the CSU campuses on issues related to water and energy.

The CSU5 are supporting Energize California's goals through two main tasks. The first task is to identify and consolidate sources of data and information that will help stakeholders to describe, assess, and prioritize opportunities for energy innovation in underserved communities in the four-county project area. In addition to this GIS data-intensive work, the CSU5 plans to host a series of workshops and events over the five-year span of the funded Energize California programming. Each of the five universities will host multiple events, addressing multiple goals and focusing on the strengths associated with each of the principal investigators from each campus. By leveraging these two work steams, we anticipate a feedback loop that allows real time community-level information to influence data collection and community assessments – and vice versa.

In terms of definitions, generally speaking California's underserved communities are defined as having a median household income that is less than 80% of the statewide annual income (PRC Section 75005(g)). Sometimes referred to as Disadvantaged Communities (DACs) depending on the regulatory assessment tool used, these communities generally face several challenges including: lack of administrative and institutional capacity to participate in the various federal and state agency
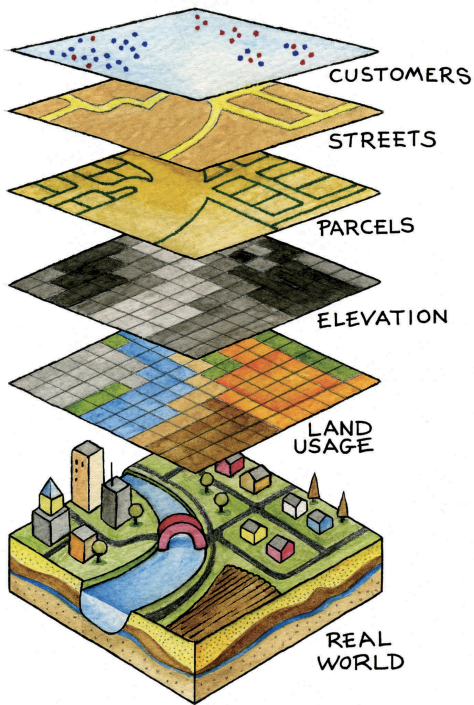
Figure 1

assistance programs, lack of awareness about the many tools and resources available, and lack of connection and access to the region's broader ecosystem of cleantech solutions.

Through the development of the CSU5 geographic information system (GIS) assessment database tool, Energize California will finally have access to a database that can identify and analyze the vectors between clean energy innovation and deployment and the unique needs and opportunities found in underserved communities. "Clean energy innovations" includes both surfacing opportunities to deploy cleantech innovation in vulnerable communities as well as finding and assisting innovators in these communities with bring their ideas to market.

Energize California hopes to leverage the CSU5 assessment database and the direct community engagement workshops and events as ways to build DACs' internal capacities and augment the program's broader social, economic, and environmental impacts by developing new and more effective ways to identify, engage with, and build capacity for DAC clean energy entrepreneurship and technology deployment opportunities.

This report is the first in a series that describes Stage One of the CSU5 tasks: the development of the GIS database and the results of the analysis of the database. The report begins with a literature and systems review of current practices, focusing on the current practices of: identifying and prioritizing underserved communities, identifying the types of data and information being collected, and describing the overall methodology and goals of the task. The review will be used by the CSU5 team to develop a new GIS database with better methodologies for identifying communities, collecting relevant information from the communities, and analyzing opportunities in underserved communities. Subsequent reports will focus on populating the GIS database with additional information (either more extensive or more granular), enabling the CSU5 team to better describe the vulnerable communities, draw meaningful conclusions, and identifying opportunities for energy innovation in underserved communities.

In a larger context, almost all of the State agencies in California, including the California Energy Commission, have some type of program(s) within their domain aimed at providing assistance to underserved communities. One of the issues facing underserved communities is the difficulty in navigating the various regulatory requirements developed by the agencies to access the assistance programs.

Most of the systems and methods used to identify vulnerable communities result in the development of some form of regulatory map. These regulatory maps identify the locations of communities that qualify for various programs designed to provide services and improve conditions in underserved communities. In general, the current regulatory maps used to identify underserved communities in California differ between agencies and are not an accurate display of exactly where these communities exist, nor the exact nature the social, economic and environmental challenges they face.

Additional challenges with most of the current state agency programs for underserved communities are that there are limited resources to administer the programs, and there is no systematic analysis and method to facilitate prioritizing one community over another. Therefore, state agencies rely on their individual regulatory maps, knowing they function as only approximate estimations of where the State's limited resources would most efficiently and effectively be deployed to the neediest communities. Finally, with each state agency focused on fulfilling its own mission, there is rarely an opportunity to comprehensively evaluate which project types would be more sustainable and suitable in specific vulnerable communities compared to other projects. And there is little to no systematic analysis of the opportunities for innovation or entrepreneur engagement in these communities.

Through this project, Energize California will have access to a far more robust and comprehensive GIS database and assessment methodology, resulting in increased granularity and accuracy in identifying underserved communities as well as methodologies for helping to prioritize communities and project types. It is envisioned that this pioneering work initiated by Energize California may help inform California's other agencies on how a more accurate and consistent method for identification and prioritization can make their programs more accessible and beneficial to the communities most in need of assistance. The first stage in developing these methodologies is a detailed literature and system review to thoroughly understand the state of the art in identifying and prioritizing these communities.

Planned GIS Database

Overview of the Task Goals

There are three initial steps to assessing and prioritizing local assistance need:

1. Measuring the location and scale of the local environmental/energy/water problems and opportunities
2. Measuring a community's degree of social disadvantage
3. Determining the type and sustainability of potential interventions, including technical assistance, assistance to local entrepreneurs, capacity building, and innovation pilot opportunities.
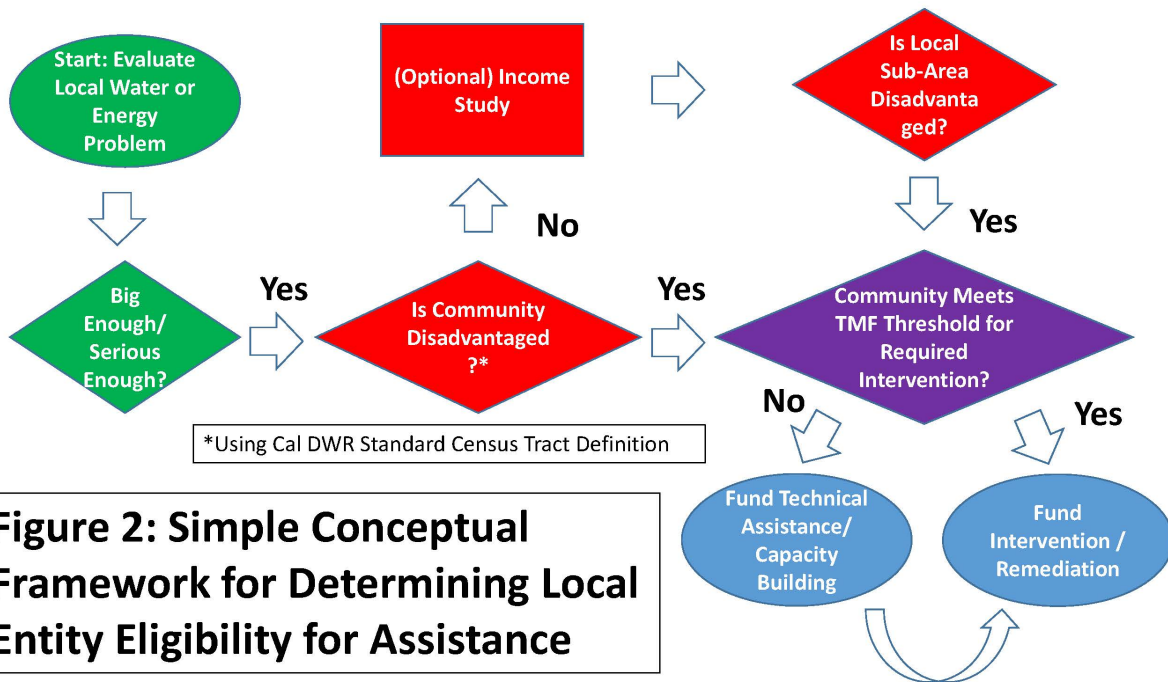

Figure 2: Simple Conceptual Framework for Determining Local Entity Eligibility for Assistance

*Using Cal DWR Standard Census Tract Definition

Figure 2 illustrates the three general stages of identification and evaluation and are coded in colors: The magnitude of environmental or resource problem is in green, the determination of local social disadvantage is in red, and the determination of agency capability is in purple. Resulting outcome decisions are shown in blue. For each of the process stages, measurement and decision rules will be developed in accordance with state-of-the-art domain knowledge.

For current purposes, the set of environmental problems to be evaluated will include risks associated with unstable/unsustainable energy and water supply and/or delivery, natural hazards and climate change, and chronic and acute contamination of air, water and soil. Ideally, the toolkit will not only

incorporate the current understanding of thresholds associated with known threats given today's conditions, but will also be equipped to perform scenario development based on informed assumptions about future conditions, notably under various regimes of climate change and/or future energy resource depletion or development.

In the context of this toolkit, we will initially define local social risk using the California Department of Water Resources' (DWR) census tract-level median household income (MHI) thresholds. We plan to refine that existing decision rule in three ways:

- First, we plan to use the power inherent in the GIS system to identify potential disadvantaged communities at a more local scale than the census tracts, because the latter are typically large enough to obscure smaller pockets of social disadvantage.

- Second, we plan to develop multi-criteria measures of socio-economic deprivation and incorporate these into the GIS toolkit. In addition to income, criteria to be incorporated will include levels of educational attainment, business types, and local economic drivers and local aggregate English language ability (the latter as a measure of acculturation). In this way, we plan to identify local communities at appropriate scales that are home to particularly vulnerable subpopulations that are socially isolated because they lack effective political or social representation.

- Third, the team will develop multi-criteria measures for determining if an identified community can sustain an intervention. For example, can a community afford a potential rate increase associated with a utility infrastructure upgrade? Agency or community capability to execute a proposed intervention will initially be determined using the state of California's Technical Management Feasibility (TMF) reporting process. Other measures could include the apportioned benefit of a proposed intervention. For example, are the types of intervention opportunities found in one community of higher benefit to the community than opportunities found in other communities?

Eligibility versus Prioritization

As part of our planning for developing the GIS database and toolkit, we have determined that the tools should go beyond determining whether a local environmental problem meets minimum threshold criteria for severity, social disadvantage, and agency capability (i.e. whether it is eligible for assistance according to the given criteria). Since, unfortunately, need is always greater than available resources, the problem of apportionment is not a problem of minimum eligibility, but rather one of ranking eligible projects so that the most urgent suitable interventions can be prioritized—an operation referred to by geospatial analysts as *suitability analysis.*

Determining relative suitability thus requires the computation of an overall suitability index score, rather than a set of simple yes/no determinations whether the problem meets all minimum eligibility criteria for assistance. Conceptually then, in the final toolkit, the decision steps represented by the diamond shapes in Figure 2 will each also include a score computation. If a problem under analysis meets all thresholds (i.e. minimum scores) at each stage, a final additional computation will yield a composite, multi-criteria suitability score upon which the set of projects analyzed can be ranked for prioritization and selection.

GIS Database and Toolbox Development and Dissemination Plans

We anticipate the work going forward in three stages lasting about one year each. The first stage will be research. In this stage, we will review relevant scientific and agency literature and critically evaluate existing related databases and decision support toolkits to determine accepted metrics and best practices. This report contains the initial results of Stage One. In the second stage, we will design specifications for the system based on the aforementioned research and build and populate an alpha version of the system. This will be described in the second of this series of reports. In the third stage, we will test the alpha version, develop a beta version, recruit beta testers, and promote the system to groups of interested stakeholders. Outreach, promotion of the release version, and technical assistance will continue beyond the third year of testing and initial outreach. This will be described in a third report and accessible as a Web-based tool.

Methodology for Stage One System Review

Evaluating Existing Resources Used to Measure Social and Environmental Risk

The CSU5 are developing a relational database to manage our evaluation of the relevant literature and existing related databases and decision support toolkits (hereafter called "systems".) Each article or system will be a database element with defined fields, plus a section for open-ended commenting. The CSU5 team has identified 13 systems for the initial evaluation. The team will continue to add system resources for evaluation as they are discovered and will periodically update this report. Each one of the systems was researched and thoroughly used by the team. Once the system was thoroughly understood by the evaluator, the evaluator then populated the database with the relevant information from the system. The team also has begun an annotated bibliography of relevant publications listed in Appendix A. This bibliography will be periodically updated.
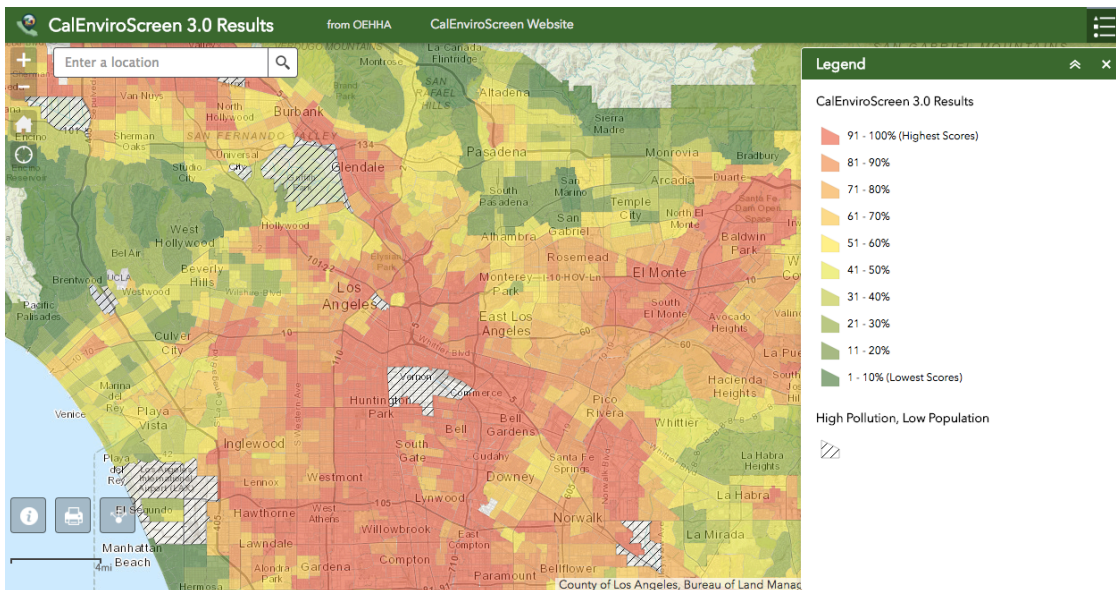
Figure 3. Example of an online resource for identifying and prioritizing communities based on aggregating environmental health data onto census tracts. Cal Enviroscreen 3.0

Once the database was populated, the evaluation team compared the resources, evaluating each resource's usefulness, stated vs. actual performance, scale and granularity of data, ease of use, and applicability to Energize California's goals.

Evaluation Database Field Definitions
1. *Organization URL*
2. *Resource type.* Values are bibliographic (1) or online resource (2)
3. *Subject Type.* Values=water (1), energy (2), social disadvantage (3), agency capacity (4)

4. *Author (and/) or responsible agency or company name*
5. *Name of system*
6. *Contact information*
7. *Date released/published*
8. *Update history*
9. *Geographic scope of data*
10. *Time Interval(s) of Data*
11. *System narrative*
12. *Flat table downloads*
13. *Type of GIS interface (if any)*
14. *Type of search, sorting, and display (browse, SQL type, map…?)*
15. *Factor combining/layering capabilities for raw data (if any)*
16. *Multi-criteria index scoring algorithms and tools informed by appropriate domain-specific inclusion and weighting criteria (if any)*
17. *Different from other systems; is something unique?*
18. *Does the system reasonably achieve its stated goal?*
19. *Is it intuitive for the layperson, or does it require training or expertise?*
20. *Applicability to the intended outcomes of the Energize California program*
21. *Open text comments*

For the duration of the project, we will continue seeking additional existing data and analysis resources and plan to evaluate them according to the same system evaluation described above. Lessons learned from newly discovered resources will be incorporated into subsequent project planning stages and software versions as they become available.

List of Systems in Initial Evaluation (in alphabetical order)

1. *Build Healthy Places Network* http://www.buildhealthyplaces.org/measureup/mapping-tools/
   Build Healthy Places Network's mission is to catalyze and support collaboration across the health and community development sectors, together working to improve low-income communities and the lives of people living in them. The mission is achieved by connecting leaders and practitioners, curating resources and examples of what works, and building the knowledge base for cross-sector collaboration. The Network provides a variety of maps and mapping tools to help demonstrate disparity and need, provide baseline data, document trends, and much more. Featured resources include Mapping Social Determinants of Health, Mapping Equity, Mapping Neighborhood Demographics, and Mapping Child Opportunity.

2. *CalEnviroScreen* https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30
CalEnviroScreen is a screening methodology that can be used to help identify California communities that are disproportionately burdened by multiple sources of pollution. This version updates

CalEnviroScreen in a variety of ways. The updates are described in more detail in the *New in CalEnviroScreen 3.0* document below.

3. *Council for Watershed Health, DAC Report* https://www.watershedhealth.org/

Builds off DWR MHI census tract map, modified with geoprocessing models to refine the geographic accuracy. Identified over 90 underserved communities in Los Angeles County.

4. *Department of Water Resources, Disadvantaged Communities Tracts*
https://gis.water.ca.gov/app/dacs/

DWR's Disadvantaged Community Tracts layer depicts data from the US Census ACS 2010-2014 showing census tracts identified as disadvantaged communities (less than 80% of the State's median household income) or severely disadvantaged communities (less than 60% of the State's median household income).

5. *Environmental Protection Agency, EnviroAtlas* https://www.epa.gov/enviroatlas

EnviroAtlas provides interactive resources that allow users to discover, analyze, and download data, maps, and other information. EnviroAtlas can be used to inform decision making at multiple scales. Resources are organized around the benefits people receive from nature or "ecosystem services".

6. *Environmental Protection Agency, Recovery Potential Screening* https://www.epa.gov/rps

Monitoring under the Clean Water Act has identified tens of thousands of polluted US water bodies that are in need of restoration. Many healthy waters without watershed protection strategies are also at risk of becoming polluted. The Recovery Potential Screening (RPS) website provides technical tools and methods to help government and private programs compare watersheds and plan their efforts for greater likelihood of restoration and protection success. RPS users during the past ten years have included over 20 state water quality programs, local watershed groups, river basin managers (U.S. and international), tribes, and federal environmental agencies.

7. *Measure of America* http://www.measureofamerica.org/maps/

Measure of America provides easy-to-use, yet methodologically sound, tools for understanding the distribution of well-being and opportunity in America and stimulating fact-based dialogue about issues we all care about: health, education, and living standards.

8. *The Opportunity Index* http://opportunityindex.org/#7.00/33.913/-115.907/Orange/California

The Opportunity Index is designed to provide a snapshot of what opportunity looks like at the state and county levels. The Index focuses on the conditions present in different communities and is designed to help local communities connect economic, academic, civic and other factors that support increased opportunity and economic mobility. The 2016 Opportunity Index provides Opportunity Scores for all 50 U.S. states and the District of Columbia, and Opportunity Grades for 2,763 counties

which contain 99 percent of the nation's population. These notes provide the methodology for calculating the 2016 Opportunity Index.

9. *PolicyMap* https://www.policymap.com/

PolicyMap offers easy-to-use online mapping with data on demographics, real estate, health, jobs, and more in communities across the U.S. From the classroom to the boardroom, thousands of organizations trust PolicyMap to find the right data for their research, market studies, business planning, site selection, grant applications, and impact analysis. The company builds interactive mapping applications.

10. *SEDAC* http://sedac.ciesin.columbia.edu/theme/sustainability/maps/services

SEDAC, the Socioeconomic Data and Applications Center, is one of the Distributed Active Archive Centers (DAACs) in the Earth Observing System Data and Information System (EOSDIS) of the U.S. National Aeronautics and Space Administration. Focusing on human interactions in the environment, SEDAC has as its mission to develop and operate applications that support the integration of socioeconomic and earth science data and to serve as an "Information Gateway" between earth sciences and social sciences.

11. *ProximityOne* http://proximityone.com/about.htm

ProximityOne develops, provides access to, and analyzes "resources to create and apply insight." Their geographic-demographic-economic data and analytical tools can help users knit together and use diverse data in a decision-making and analytical framework. Demographic-economic estimates and projections can help users better understand the current situation/area characteristics and how areas of interest might change in the future. The company offers geocoding tools and services to geocode address data that can then be visually analyzed in maps and otherwise to facilitate impact and geospatial analyses.

12. *United States Census Bureau, Small Area Income and Poverty Estimates*
https://www.census.gov/did/www/saipe/data/interactive/saipe.html?s_appName=saipe&map_yearSelector=2014&map_geoSelector=mhi_c&s_measures=mhi_snc

The U.S. Census Bureau's Small Area Income and Poverty Estimates (SAIPE) program provides annual estimates of income and poverty statistics for all school districts, counties, and states. The main objective of this program is to provide estimates of income and poverty for the administration of federal programs and the allocation of federal funds to local jurisdictions. In addition to these federal programs, state and local programs use the income and poverty estimates for distributing funds and managing programs.

13. *WSIO* https://gispub.epa.gov/wsio/

Using WSIO, the user defines a geographic area (River Basin, State) and selects indicators supporting the objective(s) of their comparison. The WSIO Tool downloads the user-selected data directly into the

Excel workbook. Users can then calculate ecological, stressor, and social indicator scores, as well as a combined Watershed Index score to use for comparison and analysis. The Tool creates a ranked list of the results and visual comparison tools in the form of bubble plots and maps. Multiple analyses can be performed and saved.

Evaluation Database

Watershed Index Online (WSIO)	Organization URL	
	https://gispub.epa.gov/wsio/	
	Resource Type	
	Downloadable application	
	Subject Type	
	Watershed with social and environmental indices	
	Author / Responsible Agency / Company Name	
	US Environmental Protection Agency	
	Name of System	
	Watershed Index Online (WSIO)	
	Contact Information	
	(202) 564-4700	
	Date Released / Published	
	Apr-15	
	Update History	
	Maintained periodically	
	Geographic Scope of Data	
	USA	
	Time Internal(s) of Data	
	Varies by factor	
	System Narrative	
	The user defines a geographic area (River Basin, State) and selects indicators supporting the objective(s) of their comparison. The WSIO Tool downloads the user-selected data directly into the Excel workbook. Users can then calculate ecological, stressor, and social indicator scores, as well as a combined Watershed Index score to use for comparison and analysis. The Tool creates a ranked list of the results and visual comparison tools in the form of bubble plots and maps. Multiple analyses can be performed and saved.	
	Flat Table Downloads (y/n)	
	Yes, application with data is downloadable	
	Type of GIS Interface	

Esri ArcGIS	
Type of Search, Sorting, and Display	
Accesses all of ArcGIS search, sorting, and display functions	
Factor Combining / Layering Capabilities	
Accesses all of ArcGIS layering capabilities and tools	
Multi-criteria Index	
Unweighted additive	
Different from Others / Unique?	
Models multiple ecosystem services (for example, climate, soil, water). Watershed scale, not arbitrary land class unit.	
Achieve Stated Goal?	
Yes, but needs improvement in geographic scale and index construction.	
Intuitive or Requires Training?	
Requires some expertise in Excel and ArcGIS.	
Applicable to Energize CA?	
Watersheds probably not applicable as a land class unit, but could inform our model and ArcGIS design/architecture. Raw data could be useful.	
Remarks	

EnviroAtlas	Organization URL	
	https://www.epa.gov/enviroatlas	
	Resource Type	
	Online mapping application	
	Subject Type	
	Multiple environmental services	
	Author / Responsible Agency / Company Name	
	US Environmental Protection Agency	
	Name of System	
	EnviroAtlas	
	Contact Information	
	(202) 564-4700	
	Date Released / Published	
	Update History	
	Maintained periodically	
	Geographic Scope of Data	
	USA	
	Time Internal(s) of Data	
	Varies by factor	
	System Narrative	
	EnviroAtlas provides interactive resources that allow users to discover, analyze, and download data, maps, and other information. EnviroAtlas can be used to inform decision-making at multiple scales. Our resources are organized around the benefits people receive from nature or "ecosystem services".	
	Flat Table Downloads (y/n)	
	EnviroAtlas National and Community data are made freely available for download.	
	Type of GIS Interface	
	Esri ArcGIS	
	Type of Search, Sorting, and Display	
	Limited customized selection of features.	

Factor Combining / Layering Capabilities	
Yes, allows for turning on and off layers in display, but no geoprocessing	
Multi-criteria Index	
No multicriteria indexing.	
Different from Others / Unique?	
Unique custom tools. Same dataset as WSIO. Custom predictive climate change model. Custom geoanalytic models.	
Achieve Stated Goal?	
Yes, as a watershed-based planning tool.	
Intuitive or Requires Training?	
Need to understand concepts of GIS and watershed ecosystem services, but execution of tools is intuitive.	
Applicable to Energize CA?	
Watersheds probably not applicable as a land class unit, but could inform our model and ArcGIS design/architecture. Raw data could be useful.	
Remarks	

Recovery Potential Screening *(incomplete review)*	*Organization URL*	
	https://www.epa.gov/rps	
	Resource Type	
	Subject Type	
	Author / Responsible Agency / Company Name	
	Environmental Protection Agency	
	Name of System	
	Recovery Potential Screening	
	Contact Information	
	N/A	
	Date Released / Published	
	Update History	
	Geographic Scope of Data	
	Time Internal(s) of Data	
	System Narrative	
	Monitoring under the Clean Water Act has identified tens of thousands of polluted US water bodies that are in need of restoration. Many healthy waters without watershed protection strategies are also at risk of becoming polluted. This Recovery Potential Screening (RPS) website provides technical tools and methods to help government and private programs compare watersheds and plan their efforts for greater likelihood of restoration and protection success. RPS users during the past ten years have included over 20 state water quality programs, local watershed groups, river basin managers (US and international), tribes and federal environmental agencies.	
	Flat Table Downloads (y/n)	
	Type of GIS Interface	

Type of Search, Sorting, and Display	
Factor Combining / Layering Capabilities	
Multi-criteria Index	
Different from Others / Unique?	
Achieve Stated Goal?	
Intuitive or Requires Training?	
Applicable to Energize CA?	
Remarks	

Policy Map	Organization URL	
	https://www.policymap.com/	
	Resource Type	
	Online mapping application	
	Subject Type	
	Business planning/economic	
	Author / Responsible Agency / Company Name	
	Policy Map	
	Name of System	
	Policy Map	
	Contact Information	
	1-866-923-MAPS (6277)	
	Date Released / Published	
	Update History	
	Maintained periodically	
	Geographic Scope of Data	
	USA	
	Time Internal(s) of Data	
	Varies by factor	
	System Narrative	
	PolicyMap offers easy-to-use online mapping with data on demographics, real estate, health, jobs, and more in communities across the U.S. From the classroom to the boardroom, thousands of organizations trust PolicyMap to find the right data for their research, market studies, business planning, site selection, grant applications, and impact analysis. The company builds interactive mapping applications.	
	Flat Table Downloads (y/n)	
	Yes, for a fee	
	Type of GIS Interface	
	Esri ArcGIS	
	Type of Search, Sorting, and Display	
	Pan, zoom, manual ID. No search capability.	

Factor Combining / Layering Capabilities	
Has multiple layers, but can only display one layer at a time.	
Multi-criteria Index	
No multicriteria indexing.	
Different from Others / Unique?	
For-fee service. Contains socioeconomic, financial, and housing data.	
Achieve Stated Goal?	
No. Useful data is available free from federal agencies.	
Intuitive or Requires Training?	
Intuitive to lay person.	
Applicable to Energize CA?	
Only interesting as list of variables to consider including, but would acquire data elsewhere.	
Remarks	

Socioeconomic Data and Applications Center (SEDAC)	Organization URL	
	http://sedac.ciesin.columbia.edu/theme/sustainability/maps/services	
	Resource Type	
	Online data portal	
	Subject Type	
	Environmental, social, economic, demographic	
	Author / Responsible Agency / Company Name	
	CIESIN/NASA	
	Name of System	
	Socioeconomic Data and Applications Center (SEDAC)	
	Contact Information	
	(845)365-8988	
	Date Released / Published	
	Varies by factor	
	Update History	
	Maintained periodically	
	Geographic Scope of Data	
	Global	
	Time Internal(s) of Data	
	Varies by factor	
	System Narrative	
	SEDAC, the Socioeconomic Data and Applications Center, is one of the Distributed Active Archive Centers (DAACs) in the Earth Observing System Data and Information System (EOSDIS) of the U.S. National Aeronautics and Space Administration. Focusing on human interactions in the environment, SEDAC has as its mission to develop and operate applications that support the integration of socioeconomic and earth science data and to serve as an "Information Gateway" between earth sciences and social sciences.	
	Flat Table Downloads (y/n)	
	Data is free and downloadable	
	Type of GIS Interface	
	Esri ArcGIS	
	Type of Search, Sorting, and Display	

Pan, zoom, manual ID. No search capability.	
Factor Combining / Layering Capabilities	
Many separate maps for individual layers; no combination.	
Multi-criteria Index	
No multicriteria indexing.	
Different from Others / Unique?	
Unique synchronized pan and zoom. Derived from remote sensing; 30 meter resolution.	
Achieve Stated Goal?	
Yes, functions as data portal.	
Intuitive or Requires Training?	
Intuitive to lay person.	
Applicable to Energize CA?	
Probably not. Scale is very coarse.	
Remarks	

Opportunity Index	Organization URL	
	http://opportunityindex.org/#7.00/33.913/-115.907/Orange/California	
	Resource Type	
	Online mapping application	
	Subject Type	
	Social and economic mobility	
	Author / Responsible Agency / Company Name	
	Opportunity Index	
	Name of System	
	Opportunity Index	
	Contact Information	
	info@opportunitynation.org	
	Date Released / Published	
	Annually updated	
	Update History	
	Updated annually	
	Geographic Scope of Data	
	USA	
	Time Internal(s) of Data	
	Single year	
	System Narrative	
	The Opportunity Index is designed to provide a snapshot of what opportunity looks like at the state and county levels. The Index focuses on the conditions present in different communities and is designed to help local communities connect economic, academic, civic and other factors that support increased opportunity and economic mobility. The 2016 Opportunity Index provides Opportunity Scores for all 50 U.S. states and the District of Columbia, and Opportunity Grades for 2,763 counties which contain 99 percent of the nation's population. These notes provide the methodology for calculating the 2016 Opportunity Index.	
	Flat Table Downloads (y/n)	
	No	
	Type of GIS Interface	
	Unknown	

Type of Search, Sorting, and Display	
Pan, zoom, manual ID. No search capability.	
Factor Combining / Layering Capabilities	
No layering capability.	
Multi-criteria Index	
The methodology for calculating the Opportunity Index requires three steps: normalizing the indicators in order to put them all on a common scale; averaging rescaled scores together within each of the three dimensions of the Index; and averaging the three	
Different from Others / Unique?	
Assigns scores to counties and states based on economic mobility. Provides ranking based on economic data. Has pre-formatted, printable report.	
Achieve Stated Goal?	
Yes, functions as data viewer and index tool.	
Intuitive or Requires Training?	
Intuitive to lay person.	
Applicable to Energize CA?	
Pre-formatted output may be applicable to project.	
Remarks	

Build Healthy Places Network	Organization URL	
	http://www.buildhealthyplaces.org/measureup/mapping-tools/	
	Resource Type	
	Online mapping application	
	Subject Type	
	Social, health, and demographics	
	Author / Responsible Agency / Company Name	
	Community Commons	
	Name of System	
	Build Healthy Places Network	
	Contact Information	
	admin@buildhealthyplaces.org	
	Date Released / Published	
	Varies by factor	
	Update History	
	Maintained periodically. Allows user generated additional content	
	Geographic Scope of Data	
	USA	
	Time Internal(s) of Data	
	Varies by factor	
	System Narrative	
	Build Healthy Places Network's mission is to catalyze and support collaboration across the health and community development sectors, together working to improve low-income communities and the lives of people living in them. The mission is achieved by connecting leaders and practitioners, curating resources and examples of what works, and building the knowledge base for cross-sector collaboration. The Network provides a variety of maps and mapping tools to help demonstrate disparity and need, provide baseline data, document trends, and much more. Featured resources include Mapping Social Determinants of Health, Mapping Equity, Mapping Neighborhood Demographics, and Mapping Child Opportunity.	
	Flat Table Downloads (y/n)	
	No data downloads	
	Type of GIS Interface	

Esri ArcGIS	
Type of Search, Sorting, and Display	
Full suite of Esri ArcGIS search functions	
Factor Combining / Layering Capabilities	
Yes, allows for turning on and off layers in display, but no geoprocessing	
Multi-criteria Index	
No	
Different from Others / Unique?	
Allows for login. Allows user-generated content. Excellent graphics and cartography. Allows user to save composed views and share digitally and in print.	
Achieve Stated Goal?	
Yes, provides useful information for cross-sector collaboration.	
Intuitive or Requires Training?	
Fairly intuitive, but must have some GIS knowledge to fully exploit the search functions.	
Applicable to Energize CA?	
Yes, applicable, particularly user model, bookmarking capabilities, and printing. Would want to know more about other ways to access data.	
Remarks	

Measure of America	Organization URL	
	http://www.measureofamerica.org/maps/	
	Resource Type	
	Online mapping application	
	Subject Type	
	Health, education, living standards	
	Author / Responsible Agency / Company Name	
	Social Science Research Council	
	Name of System	
	Measure of America	
	Contact Information	
	contact@measureofamerica.org	
	Date Released / Published	
	Varies by factor	
	Update History	
	Updated periodically	
	Geographic Scope of Data	
	USA	
	Time Internal(s) of Data	
	Varies by factor	
	System Narrative	
	Measure of America provides easy-to-use yet methodologically sound tools for understanding the distribution of well-being and opportunity in America and stimulating fact-based dialogue about issues we all care about: health, education, and living standards.	
	Flat Table Downloads (y/n)	
	Yes, allows table downloads	
	Type of GIS Interface	
	Unknown	
	Type of Search, Sorting, and Display	
	Pan, zoom, manual ID. No search capability.	
	Factor Combining / Layering Capabilities	

Yes, allows for turning on and off layers in display, but no geoprocessing	
Multi-criteria Index	
Computes human development index at some scales, not others.	
Different from Others / Unique?	
Pop-up report summarizes data nicely. Wide variety of indicators of human condition.	
Achieve Stated Goal?	
Yes, good local summaries of well-being.	
Intuitive or Requires Training?	
Fairly intuitive.	
Applicable to Energize CA?	
Yes, comprehensive list of social variables. Good summary report display.	
Remarks	

SAIPE	Organization URL	
	https://www.census.gov/did/www/saipe/data/interactive/saipe.html ?s_appName=saipe &map_yearSelector=2014 &map_geoSelector=mhi_c &s_measures=mhi_snc	
	Resource Type	
	Online mapping application	
	Subject Type	
	Income and poverty	
	Author / Responsible Agency / Company Name	
	US Census Bureau	
	Name of System	
	SAIPE	
	Contact Information	
	1-800-923-8282, ask.census.gov	
	Date Released / Published	
	Latest is 2015	
	Update History	
	Updated annually	
	Geographic Scope of Data	
	USA	
	Time Internal(s) of Data	
	Annual, 2009-2015	
	System Narrative	
	The U.S. Census Bureau's Small Area Income and Poverty Estimates (SAIPE) program provides annual estimates of income and poverty statistics for all school districts, counties, and states. The main objective of this program is to provide estimates of income and poverty for the administration of federal programs and the allocation of federal funds to local jurisdictions. In addition to these federal programs, state and local programs use the income and poverty estimates for distributing funds and managing programs.	
	Flat Table Downloads (y/n)	
	Yes, allows table downloads	
	Type of GIS Interface	
	Esri ArcGIS	

Type of Search, Sorting, and Display	
Pan, zoom, manual ID. No search capability.	
Factor Combining / Layering Capabilities	
Yes, allows for turning on and off layers in display, but no geoprocessing	
Multi-criteria Index	
No	
Different from Others / Unique?	
Trend line	
Achieve Stated Goal?	
Yes, good map server for county-level poverty and income data	
Intuitive or Requires Training?	
Fairly intuitive.	
Applicable to Energize CA?	
No	
Remarks	

ProximityOne	Organization URL	
	http://proximityone.com/about.htm	
	Resource Type	
	Fee for service geodemographic information company	
	Subject Type	
	Population, housing, socioeconomic	
	Author / Responsible Agency / Company Name	
	ProximityOne	
	Name of System	
	ProximityOne	
	Contact Information	
	(888) 364-7656	
	Date Released / Published	
	Update History	
	Periodically maintained	
	Geographic Scope of Data	
	USA	
	Time Internal(s) of Data	
	Unknown	
	System Narrative	
	ProximityOne develops geodemographic-economic data and analytical tools and helps organizations knit together and use diverse data in a decision-making and analytical framework. We develop custom demographic/economic estimates and projections, develop geographic and geocoded address files, and assist with impact and geospatial analyses. Wide-ranging organizations use our tools (software, data, methodologies) to analyze their own data integrated with other data.	
	Flat Table Downloads (y/n)	
	Yes, for a fee	
	Type of GIS Interface	
	Unknown	
	Type of Search, Sorting, and Display	

Unknown	
Factor Combining / Layering Capabilities	
Unknown	
Multi-criteria Index	
Unknown	
Different from Others / Unique?	
None. All data sold are available for free elsewhere.	
Achieve Stated Goal?	
Yes, but adds no value to free federal data.	
Intuitive or Requires Training?	
Unknown	
Applicable to Energize CA?	
No	
Remarks	

Calenviroscreen 3.0	Organization URL	
	https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30	
	Resource Type	
	Online mapping application	
	Subject Type	
	Identification of distressed communities	
	Author / Responsible Agency / Company Name	
	The Office of Environmental Health Hazard Assessment (OEHHA)	
	Name of System	
	Calenviroscreen 3.0	
	Contact Information	
	(916) 324-7572	
	Date Released / Published	
	Apr-17	
	Update History	
	Periodically maintained	
	Geographic Scope of Data	
	California	
	Time Internal(s) of Data	
	Varies by factor	
	System Narrative	
	CalEnviroScreen is a screening methodology that can be used to help identify California communities that are disproportionately burdened by multiple sources of pollution. This version updates CalEnviroScreen in a variety of ways. The updates are described in more detail in the New in CalEnviroScreen 3.0 document below.	
	Flat Table Downloads (y/n)	
	Yes	
	Type of GIS Interface	
	Esri ArcGIS	
	Type of Search, Sorting, and Display	
	Pan, zoom, manual ID. No search capability.	

Factor Combining / Layering Capabilities	
No layering capability.	
Multi-criteria Index	
Yes, multicriteria index scoring. Multiple factors, range of values for each factor divided into high, medium, and low classifications with weighted additive score.	
Different from Others / Unique?	
Has ranking, similar to prioritization concept. Regulatory map for AIR Boards.	
Achieve Stated Goal?	
Yes, but needs improvement in geographic scale and index construction.	
Intuitive or Requires Training?	
Intuitive to lay person.	
Applicable to Energize CA?	
Yes, applicable and must be considered since regulatory. Focus is environmental justice, not water or energy sustainability; does not contain economic data. Could be used to inform our model.	
Remarks	

Council on Watershed Health DAC report	Organization URL	
	https://www.watershedhealth.org/	
	Resource Type	
	ArcGIS desktop procedure	
	Subject Type	
	Identification of underserved communities	
	Author / Responsible Agency / Company Name	
	Council for Watershed Health	
	Name of System	
	Council on Watershed Health DAC report	
	Contact Information	
	(213) 229-9945	
	Date Released / Published	
	Update History	
	Not maintained; methodology remains current but output not current	
	Geographic Scope of Data	
	Los Angeles County	
	Time Internal(s) of Data	
	N/A	
	System Narrative	
	Builds off DWR MHI census tract map, modified with geoprocessing models to refine the geographic accuracy. Identified over 90 underserved communities in Los Angeles County.	
	Flat Table Downloads (y/n)	
	No	
	Type of GIS Interface	
	Set of instructions for using Esri ArcGIS desktop.	
	Type of Search, Sorting, and Display	
	N/A	
	Factor Combining / Layering Capabilities	
	N/A	

Multi-criteria Index	
No, used MHI threshold; innovation is geographic units, not prioritized.	
Different from Others / Unique?	
Refined census tracts to be more accurate reflection of actual location of communities at highly local scales.	
Achieve Stated Goal?	
Yes. Geographic processing sophisticated and could be automated in our model.	
Intuitive or Requires Training?	
Requires expertise in ArcGIS.	
Applicable to Energize CA?	
Yes, particularly geographic methods. May be able to do similar models for Orange, Ventura, and Santa Barbara Counties.	
Remarks	

Conclusion

The systems evaluated in this first report cover a range of scales and purposes, and we anticipate updating this portion of the report as more systems are evaluated. There are several ways the tools can be categorized. One way is to look at who is developing the systems; another is to evaluate the intended function. Developers include federal agencies, state agencies, universities, not for profit organizations (NGOs), and for-fee companies. Generally, the scale of information delivery follows the level of the agency. Federal systems are looking at land class units[1] (LCU) consisting of states and counties, state agencies usually rely on census tracts, and NGOs and for-fee systems can in some cases get down to parcel scales.

One observation from the evaluation team is that these systems at various scales could be strung together in a hierarchal model. For example, the team could screen for criteria at a census tract LCU, and then screen for criteria at a parcel LCU. There may be an additional processing efficiency return by considering this approach since modeling criteria at a parcel scale is data and processor intensive. Screening criteria hierarchically by scale may reduce the amount of intensive processing by eliminating some parcels from consideration early on.

Two of the systems evaluated to date are designed to identify underserved or stressed communities. The California DWR MHI and the system developed by the Council for Watershed Health both identify the geographic location of underserved communities. The MHI system uses income data from the census to determine the MHI. This system is a regulatory map that determines the eligibility of a community for assistance services. The data used in this system is maintained by DWR.
The Council for Watershed Health (CWH) system uses GIS modeling tools to further refine the MHI maps. The GIS processes used were manually executed and included standard GIS techniques, including buffering and polygon intersects; for example, using interstate highways as a feature to split a census LCU into multiple LCUs. This system is not maintained and is meant as a snapshot of one point in time.

As mentioned earlier in this report, the MHI based on census tracts, while regulatory, is not an accurate depiction of a community or of an underserved community. However, this data is maintained regularly. The CWH system refines the geography and increases the locational accuracy of the community, but is manually created and not easily repeatable. It also requires a level of GIS expertise, making it inaccessible to the layperson. The modeling used in the CWH system is similar to the concepts we are considering for the identification of underserved communities. The evaluation team

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[1] Land classification unit (LCU) is the polygon feature in the GIS used to represent data. For example, a LCU can be a state polygon, county polygon, census track, utility service area or parcels.

believes some of the GIS functions used by CWH could be automated in a new system making them more accessible.

Several of the systems model opportunity. Opportunity types include economics, health, and livability. In general, these systems model data and develop a ranking scale. This is similar in concept to our goal of prioritizing underserved communities. An interesting observation from the Stage One evaluation team was that areas receiving low-opportunity scores could indicate underserved areas. We also believe that we can borrow concepts from these tools to develop more comprehensive indicators of a community type. These can also possibly be used as indices that could be reevaluated after an intervention activity in an underserved community to help understand the positive or negative impact of the intervention.

The focus of CalEnviroscreen 3.0 is on public health and environmental justice and does not incorporate any economic data. The modeling of the data used in CalEnviroscreen to develop its ranking scale at this point is probably the closest to the types of modeling we are considering for prioritizing underserved communities. CalEnviroscreen generally takes a range of data values and classifies them into continuous scores and uses a weighted averaging to combine data types into a single ranking score. We believe the methodologies for classifying data into ranked categories could be done using more sophisticated classification techniques to further refine the final ranking.

The for-fee systems evaluated and systems like SEDAC from NASA are primarily data repositories. Systems like SEDAC don't provide analysis capabilities, but we will continue to evaluate them and catalogue them as resources in our clearinghouse. The for-fee systems can provide analytic services. A majority of these types of services could be considered professional services where they are generally providing expert GIS services. In most cases, this will be redundant to the evaluation team's capacity.

A final observation from the evaluation team is that between the public and for-fee system, there are a lot of data available. Just considering the systems evaluated in this initial process, most of the types of data we conceptually believe we will need appears available. This should reduce the need for any time intensive data development and allow the team to focus on developing the methodology and prioritization tools in future Stages of the project.

Appendix A

Annotated Bibliography of Articles and Monographs Regarding Measuring and Ranking Disadvantaged Communities

Source	Agency/ Journal	Author	Notes
California Unincorporated: Mapping Disadvantaged Communities in the San Joaquin Valley	PolicyLink	Chione Flegal, Solana Rice, Jake Mann, Jennifer Tran	Use median income threshold plus parcel density and unincorporated communities to identify custom DACs
What is Community Disadvantage? Understanding the Issues, Overcoming the Problem	Australian Institute of Family Studies	Rhys Price-Robertson	The Socio-Economic Indexes for Areas (SEIFA) is a widely-used measure of geographically concentrated disadvantage. It was created by the Australian Bureau of Statistics (ABS), who "broadly define relative socio-economic advantage and disadvantage in terms of people's access to material and social resources, and the ability to participate in society" (ABS, 2008). SEIFA is composed of four indexes. The Index of Relative Socio-Economic Disadvantage uses information such as low income, low education and occupational status as markers of disadvantage. The Index of Relative Socio-Economic Advantage and Disadvantage is similar to the above Index, but also includes measures of advantage. The Index of Economic Resources focuses on peoples' and households' level of access to economic resources. The Index of Education and Occupation concentrates on the general level of educational and occupational skills of people within an area.

The English Indices of Deprivation 2015 Technical Report	Department for Communities and Local Government (UK)	T. Smith, M. Noble, S. Noble, G. Wright, D. McLennan and E. Plunkett	The Indices of Deprivation 2015 provide a set of relative measures of deprivation for small areas across England, based on seven different domains of deprivation: Income Deprivation; Employment Deprivation; Education, Skills and Training Deprivation; Health Deprivation and Disability; Crime; Barriers to Housing and Services and Living Environment Deprivation
Economically Distressed Communities (EAS/EDA Determinations) Special Rule	Federal Aviation Administration	N/A	Each fiscal year, the FAA makes determinations under Title 49 U.S.C. § 47109(f), Special Rule for Economically Distressed Communities, which provides additional federal funding for airports. The determination of which locations are considered economically distressed communities is based on Section 301(a) of the Public Works and Economic Development Act of 1965 (42 U.S.C. § 3161(a)). These calculations include unemployment data and per capita income data.
GIS-based Multicriteria Decision Analysis: A Survey of the Literature	International Journal of Geographical Information Science 20, 2006, 703–726	Malczewski, J.	Reviews GIS-based multicriteria decision analysis (GIS-MCDA). Distinguishes between *multi-attribute decision problems* like for Energize California, where you select the best choice from a finite set of options, and *multi-objective decision analysis,* where you try to derive an optimal land use pattern without prior limits. Identifies techniques for multi-attribute decision approaches, in order of frequency: Weighted summation/Boolean overlay, Ideal/reference point (TOPSIS, MOLA), Analytical Hierarchy Process (AHP), Outranking methods (ELECTRE, PROMETHEE), Other

Poverty, Ethnicity and Place	Joseph Rowntree Foundation	S. Garner and G. Bhattacharyya	Provides technical guidance on the relationship between minority population concentration and poverty in local communities. Basically, these factors amplify each other and the net effect needs to be accounted for when measuring disadvantage.
Using GIS-Based Methods of Multicriteria Analysis to Construct Socio-Economic Deprivation Indices	International Journal of Health Geographics, 2007	N. Bell, N. Shuurmann, M. Hayes	Discusses GIS-based Order Weighted Average (OWA) Multicriteria Analysis (MCA) as a technique to validate deprivation indices that are constructed using more qualitative data sources. Both OWA and traditional MCA are well known and commonly used methodologies in spatial analysis, but have had little application in social epidemiology. OWA-based MCA is a sensitive instrument that permits incorporation of expert opinion in quantifying socio-economic gradients in health status. OWA applies both subjective and objective weights to the index variables, thus providing a more rational means of incorporating survey results into spatial analysis.
The SAGE Handbook of GIS and Society	SAGE Publications, 2011	T. Nyerges, H. Couclelis, R. McMaster	Research on the evolving relationship between GIS and Society has expanded and become an increasingly challenging and multi-faced endeavor. By providing a retrospective and prospective overview of GIS and Society research, this handbook assesses the evolution of research, with a particular emphasis on the theoretical, methodological, and substantive diversity. The book examines the resonances with and between key themes, and among disciplines ranging from geography, and computer science to sociology, anthropology, and the health and environmental sciences.

Indicator Analysis for Unpacking Poverty in New York City	CUNY Academic Works, 2014	A. Jochen and M. Abramovitz	Presents work exploring the persistence of health and social problems in parts of New York City. The authors' GIS framework translates a highly diverse set of variables into neighborhood indicators in order to help local residents and decision makers understand the relationship between "place" and individual behavior. Two new indices, Community Loss and Neighborhood Risks, demonstrate how data can be transformed to emphasize the communal nature of phenomena that are typically understood only in relations to individuals.