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Environmental Protection
Agency

Geologic Sequestration of Carbon Dioxide – UIC Quick Reference Guide

Additional Tools for UIC Program Directors Incorporating Environmental Justice Considerations into the Class VI Injection Well Permitting Process

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I. INTRODUCTION

The purpose of the *Federal Requirements under the Underground Injection Control (UIC) Program for Carbon Dioxide Geologic Sequestration (GS) Wells* (75 FR 77230, December 10, 2010), referred to in this Quick Reference Guide as the GS Rule, is to protect underground sources of drinking water (USDWs) through permitting, siting, construction, operation, injection, post-injection site care, and site closure requirements for the underground injection of carbon dioxide. The Class VI requirements are in place to minimize potential health risks, especially risks to populations in or near the delineated area of review (AoR) for the injection well or in the anticipated direction of the carbon dioxide plume and pressure front. The UIC Program Director has a public health protection role, and may examine the potential risks of a proposed Class VI injection well within his or her jurisdiction to identify and address any particular impacts on minority and low-income populations.

EPA defines environmental justice (EJ) as the fair treatment and meaningful involvement of all people during the development, implementation, and enforcement of environmental laws, regulations, and policies, regardless of race, color, national origin, or income. EPA recommends that EJ considerations become a routine part of implementing a UIC Program, particularly during the evaluation of a Class VI permit application. As noted in Presidential Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (59 FR 7269, February 16, 1994), "[E]ach Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations in the United States and its territories..." EPA recognizes that State agencies may not be obligated to incorporate the Executive Order into their mission, but encourages UIC Program Directors to consider environmental justice as part of a comprehensive Class VI permit application review. Additional information on EJ considerations during Class VI program implementation, including the permitting process for proposed Class VI injection wells, is provided in the *Draft Underground Injection Control Program Class VI Primacy Application and Implementation Manual.*

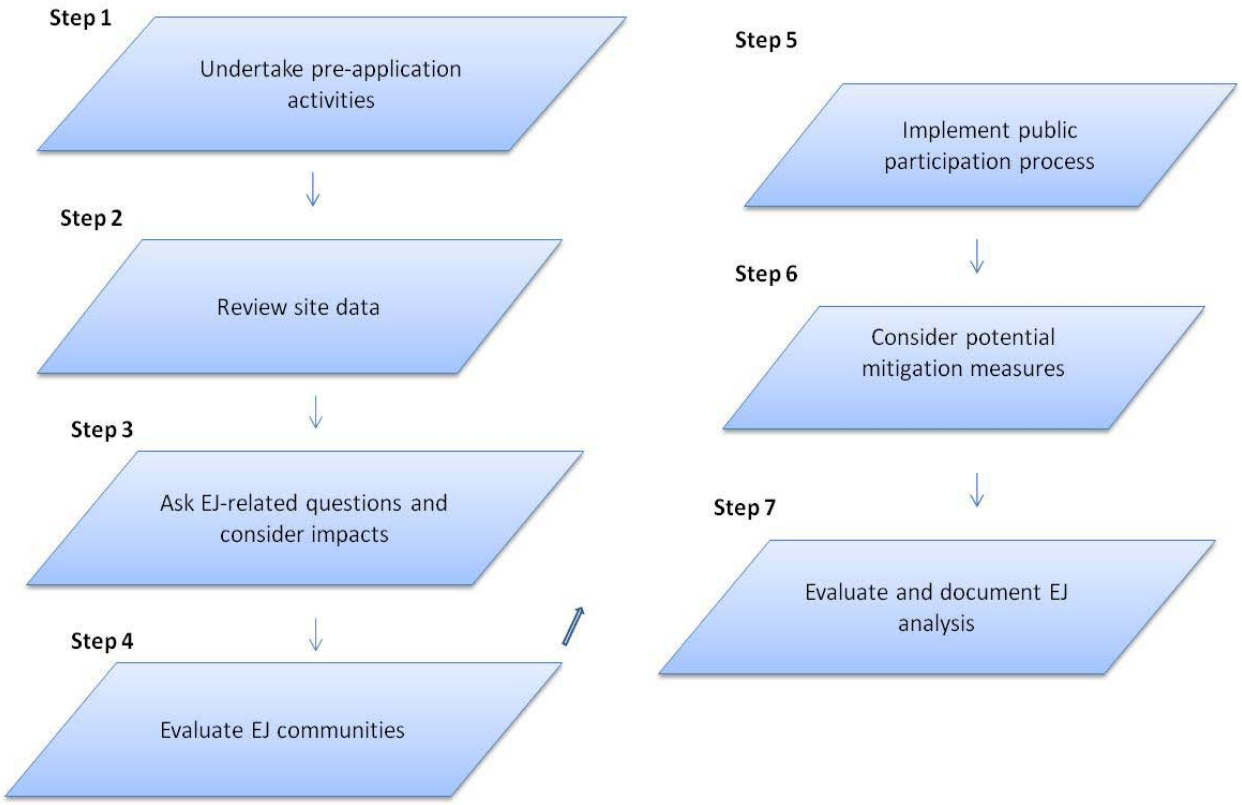
The purpose of this Quick Reference Guide is to provide UIC Program Directors with additional tools to incorporate EJ considerations into the Class VI permit application review and approval process. Permit applicants, or potential Class VI injection well owners or operators (henceforth referred to as the owners or operators), are encouraged to provide any relevant EJ information they may have as part of their permit application. EPA recognizes that there is no singular approach to conducting an EJ analysis, and intends for the Draft UIC Class VI Implementation Manual and this Quick Reference Guide to assist with any necessary EJ analysis during the permitting process.

Section II of this paper provides some suggested steps for an EJ analysis that may be conducted by a UIC Program Director during the permit review period; Section III presents an example EJ analysis for a geologic sequestration site.

II. EJ STEPS FOR UIC PROGRAM DIRECTORS AND OWNERS OR OPERATORS

This section outlines the steps of an EJ analysis, with special considerations for GS projects. Because there is no singular approach to conducting an EJ analysis, these steps, which are presented in Figure 1 and described below, provide a general flowchart for UIC Program Directors to follow when incorporating EJ considerations during permit application reviews. Alternatively, UIC Program Directors can choose to implement a modification of this flowchart.

Figure 1: Incorporating EJ Considerations into a Class VI Permit Application Review



Below is some discussion and context on these steps.

Step 1: Pre-Application Activities on EJ

If the permitting agency learns of an incoming permit application prior to its official submittal, the UIC Program Director can undertake pre-application activities, such as working with the

owner or operator to initiate discussions with the public. These pre-application activities can also help preliminarily assess whether EJ issues may be present for a particular permit review.

Step 2: Review Site Characterization Data to Determine if EJ Communities Reside within the AoR and May Be Impacted

Upon receipt of a Class VI permit application, UIC Program Directors and permit writers may choose to examine the information provided to determine if any minority or low-income communities might be impacted by the proposed well.[1] These data include: site maps; geomechanical and other site characterization data; the proposed AoR computational model parameters; the required AoR and Corrective Action Plan; and the required Emergency and Remedial Response Plan.

This initial review could also provide a good opportunity for UIC Program Directors to begin discussions with the owner or operator about EJ considerations that may need to be factored into the final permit. For instance, the Director could ask whether the owner or operator sees any potential EJ impacts that will need to be addressed based on a preliminary review of the site data. Directors may also want to determine if it is necessary to learn more about the demographics of the nearby communities.

Step 3: Ask EJ-Related Questions and Consider EJ Impacts on Communities

UIC Program Directors and permit writers might consider EJ-related questions and potential impacts when evaluating the Class VI permit application. Directors may choose to involve owners or operators in EJ discussions. Sample EJ questions include:

- Will siting the proposed Class VI well at the proposed location exacerbate any existing disproportionate impacts to minority and low-income communities within the delineated AoR?

- Will there be any environmental or health impacts on minority and low-income communities from the siting of the proposed Class VI injection well with respect to exposure and susceptibility to potential environmental hazards?

- What is the likely distribution of any environmental and public health benefits from the proposed Class VI well in communities within the delineated AoR?

[1] Any regulatory issues surrounding the UIC Program should be factored into Class VI injection well permit applications, State UIC Program primacy applications, and into the Director's review and decision making process for the proposed Class VI well, including EJ issues. These issues include the approval of an aquifer exemption for a proposed Class VI injection well; the prevention of endangerment to USDWs; the delineated, computationally-modeled AoR; and the required financial responsibility demonstration.

- Are there maps or other tools available that may assist with communicating with, and soliciting input from, identified communities about the proposed GS project and Class VI permit?

- If minority and low-income communities might be affected by the proposed Class VI injection well, can the UIC Program Director or owner or operator undertake any potential mitigation measures to improve community security and acceptance of the proposal?

To help answer these types of questions, the UIC Program Director might conduct an analysis like the one described in Step 4.

Step 4: Evaluate EJ Communities for Environmental Hazards, Exposure Impacts, and Vulnerable Sub-Populations

To gauge whether there are communities with EJ considerations at or near a proposed Class VI injection well site, UIC Program Directors and permit writers might consider an evaluation of the demographic composition of surrounding communities. Any potential benefits or impacts from the proposed GS project on these communities should be included in the evaluation. The evaluation may also include generating a demographic profile. The profile can help identify any minority or low-income communities that may be disproportionately impacted by a proposed well site. An evaluation may also consider the presence of existing environmental hazards, potential exposure pathways, and susceptible sub-populations.[2] Specific elements for a comprehensive EJ analysis might include:

- Site maps and geologic characteristics;
- Information on USDWs and baseline geochemical data;
- Modeled AoR;
- Other permitted facilities in the area; and
- Multiple/cumulative exposure risks.

EPA has developed some tools to assist permitting agencies with EJ analyses. One tool is EJView, recently released by EPA's Office of Environmental Justice (OEJ).[3] EJView is an online interactive mapping tool that integrates numerous demographic, socioeconomic, and environmental data sets. The tool allows users to visually assess the spatial relationship between neighborhoods with EJ characteristics and facilities that may adversely affect those communities (e.g., hazardous waste sites). In addition, the tool includes a querying function that generates a custom report of these data sets for a user-defined area of interest.

[2] Some population groups are more prone to more severe risk or health impacts relative to the rest of the population as a result of intrinsic characteristics such as: life stage (e.g., children), genetics (e.g., poor or slow metabolizers), and health status (e.g., diabetics and diminished immunity and healing processes; asthmatics).

[3] U.S. EPA. *EJView*. Most recently visited on October 27, 2010. http://epamap14.epa.gov/ejmap/entry.html.

An example analysis using EJView is shown in Figures 2 and 3. The map in Figure 2 shows a diverse community with a range of income levels and minority populations. The colored squares in the image show the location of sites reporting to EPA, including Superfund sites, brownfields, facilities with air emissions, and locations with hazardous materials. Eventually, when Class VI injection wells are permitted, those site locations could also be added to this type of map. The colored areas in the background illustrate minority populations within U.S. Census Blocks; the darker shades represent areas with a higher percentage of minority population. Finally, the dot density layer illustrates varying poverty levels within U.S. Census Block Groups; areas with increased density of dots represent higher levels of poverty.

An assessment of this image shows geographic areas that may warrant additional EJ analysis, particularly the areas near the center of the figure where the permitted sites reporting to EPA are located in close proximity to minority neighborhoods with high poverty levels. A UIC Program Director could choose to use EJView to help assess and map the geographic area around a proposed Class VI injection well when evaluating a permit application and all of the information submitted.

Figure 2: Example US EPA EJView Generated Map

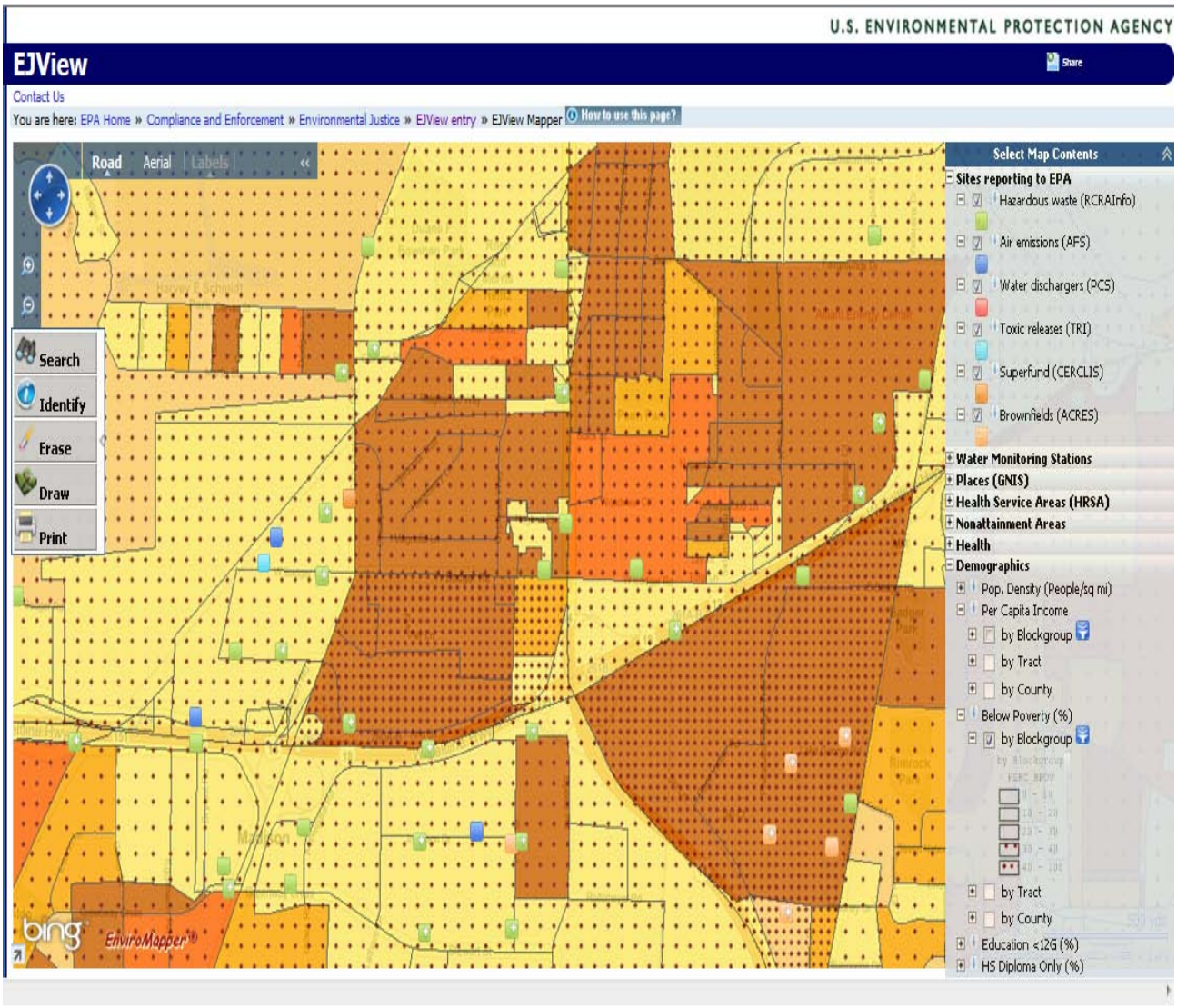
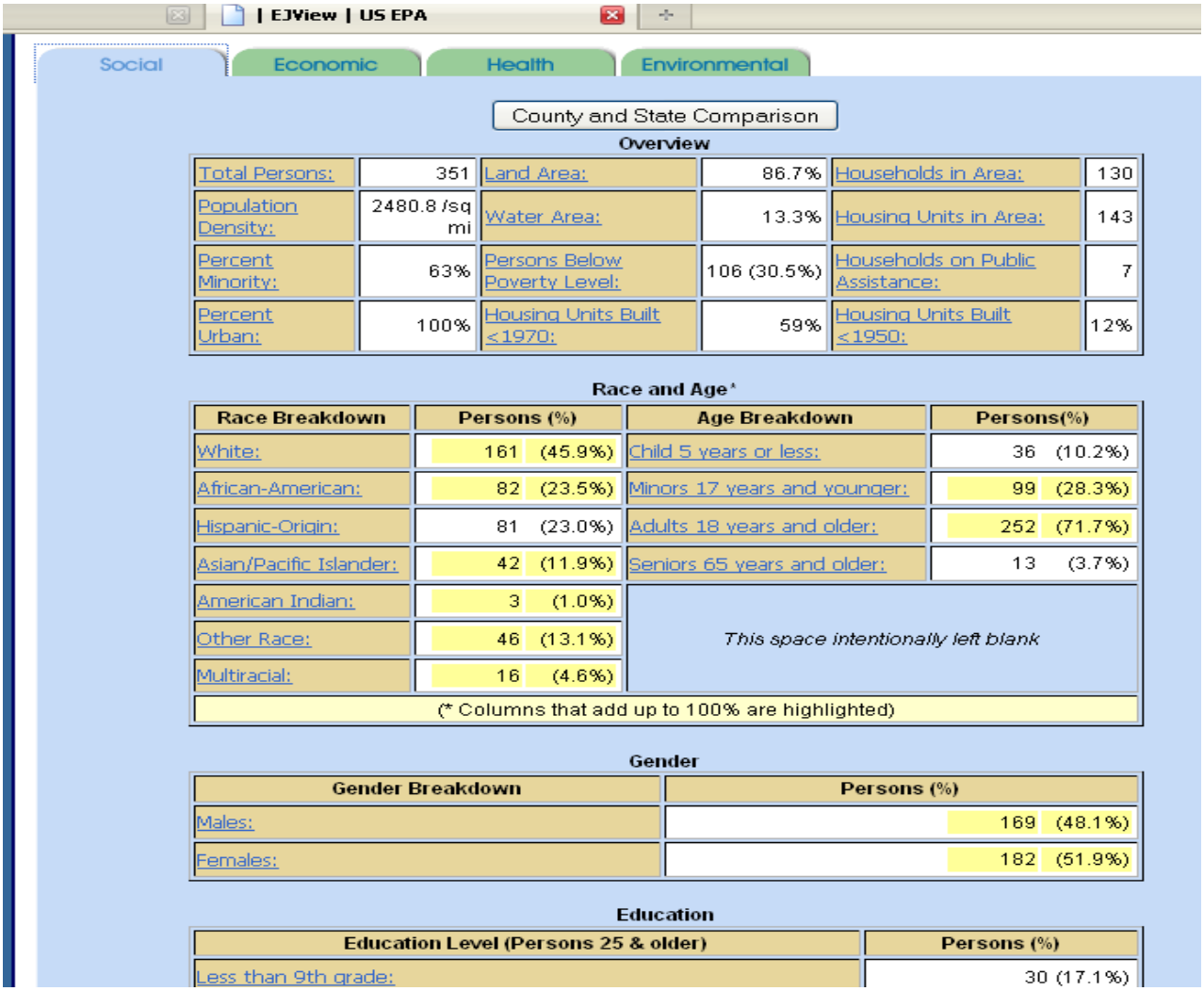


Figure 3 shows an example report generated with EJView. The report shows information on minority composition, populations below the poverty level, potentially vulnerable subpopulations, and education level, among other data. The information contained in these reports can be used to depict the social, economic, and environmental characteristics of the area. The reports can also be used to compare these attributes to other locations to quantitatively describe the relative differences between EJ and non-EJ communities in the area. A UIC Program Director could choose to use these types of data to determine whether a community has a greater minority or low-income population percentage than regional or national averages. UIC Program Directors could also determine whether, on a national or regional scale, the communities located in the area have been experiencing cumulative exposure risks that may need to be taken into consideration.

Figure 3: Example EJView Report



EJView | US EPA

Social | Economic | Health | Environmental

County and State Comparison

Overview

Total Persons:	351	Land Area:	86.7%	Households in Area:	130
Population Density:	2480.8 /sq mi	Water Area:	13.3%	Housing Units in Area:	143
Percent Minority:	63%	Persons Below Poverty Level:	106 (30.5%)	Households on Public Assistance:	7
Percent Urban:	100%	Housing Units Built <1970:	59%	Housing Units Built <1950:	12%

Race and Age*

Race Breakdown	Persons (%)	Age Breakdown	Persons(%)
White:	161 (45.9%)	Child 5 years or less:	36 (10.2%)
African-American:	82 (23.5%)	Minors 17 years and younger:	99 (28.3%)
Hispanic-Origin:	81 (23.0%)	Adults 18 years and older:	252 (71.7%)
Asian/Pacific Islander:	42 (11.9%)	Seniors 65 years and older:	13 (3.7%)
American Indian:	3 (1.0%)	*This space intentionally left blank*	
Other Race:	46 (13.1%)		
Multiracial:	16 (4.6%)		

(* Columns that add up to 100% are highlighted)

Gender

Gender Breakdown	Persons (%)
Males:	169 (48.1%)
Females:	182 (51.9%)

Education

Education Level (Persons 25 & older)	Persons (%)
Less than 9th grade:	30 (17.1%)

Using the maps and data generated by EJView could help UIC Program Directors determine the scope of any adverse—or beneficial—impacts of a proposed GS project on a community. For instance, Directors could assess whether any site construction impacts could cause temporary air or water quality, and/or transportation or noise impacts to the population.

With regard to potential beneficial impacts, the UIC Program Director can assess, for example, whether facility construction or operation might lead to an increase in employment opportunities and potentially higher wages or supplemental income. The example EJ analysis at the end of this paper provides some additional discussion on potential considerations for communities living near proposed Class VI injection wells.

In addition to EJView, UIC Program Directors can use data directly from the U.S. Census. The example EJ analysis at the end of this paper shows one way to use U.S. Census data as a tool in an EJ analysis.

At this stage of the analysis, the UIC Program Director might determine that minority and low-income populations would not be disproportionately impacted by permitting of the proposed Class VI well, and therefore further EJ analysis is not necessary. Keep in mind that even if EJ considerations are not determined to be part of a Class VI permit review, the UIC Program Director would still need to initiate public involvement, as required by 40 CFR 25 and 40 CFR 124, and described in the next few steps of the flowchart.

Step 5: Implement an Inclusive Public Participation Process

Once UIC Program Directors review proposed Class VI injection well site data and evaluate the characteristics of the community living near the proposed well, they must consider creating opportunities for public participation [40 CFR 124]. This could include providing the public with early notice of proposed Class VI injection activities, enabling face-to-face or written feedback on the permit application, or participating in public hearings and other forms of public participation.

For a more detailed discussion on public participation, including the requirements under 40 CFR 25 and 124, see the *Draft Underground Injection Control Program Class VI Primacy Application and Implementation Manual* and the *UIC Quick Reference Guide*: *Additional Considerations for UIC Program Directors on the Public Participation Requirements for Class VI Injection Wells*.

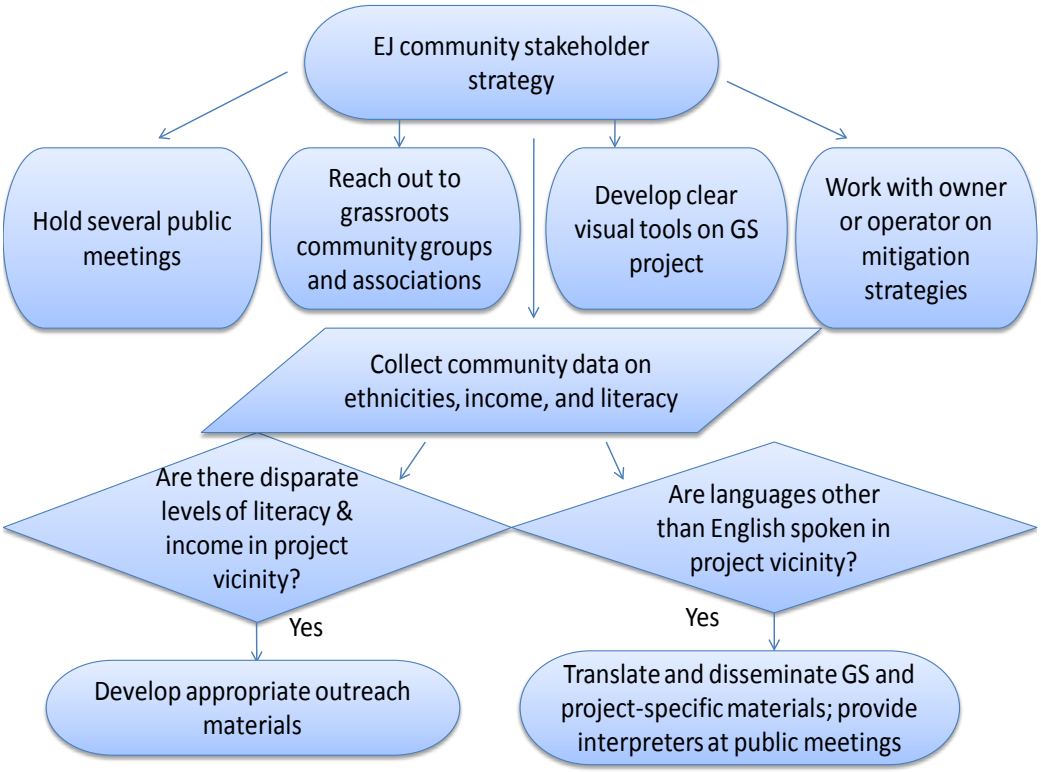
Directors may consider challenges to effective and meaningful public participation in identified EJ communities may include obstacles such as language barriers, lack of technical resources, cultural barriers, lack of access to transportation, or an inability to attend public meetings scheduled during working hours. To address these barriers, UIC Program Directors could consider conducting targeted outreach, as soon as possible, to the communities and key stakeholders identified as living within the AoR in the permit evaluation process. For example, Directors and owners or operators can arrange site visits to show the community the proposed site, or provide visual tools (e.g., graphics-heavy products) to inform the community about GS. In addition, communication materials could be translated into multiple languages. To effectively reach minority and low-income populations, the UIC Program Director and the owner or operator may also choose to: provide public notice to interested parties of pending actions via newspaper advertisements, radio, mailings, or e-mails; post flyers in key areas; provide sufficient time for the word to spread on public comment and hearings; and reach out directly to individual communities or groups.

UIC Program Directors can work with owners or operators in using new forms of information technology for targeted outreach. Some Internet and social media tools that may be useful for sharing information on GS projects include blogs, social networks, podcasts, and webcasts. [4] UIC Program Directors and owners or operators can use these tools to explain planned GS projects; describe GS technologies; and post information on the latest developments related to Class VI injection wells. Posted information may include schedules for hearings, briefings and other

[4] Social media, which are primarily Internet and mobile based technologies for disseminating and discussing information, can help provide accessibility and transparency to a wide audience.

opportunities for involvement. However, all interested stakeholders may not have ready access to these kinds of information technology, so UIC Program Directors and owners or operators should use Internet and social media outreach as a supplement to more traditional public participation methods. Internet and social media outreach also does not replace the requirements found at 40 CFR 25 and 40 CFR 124, for UIC permit application decisions to be opened to the public. An example approach to conducting outreach on a proposed Class VI injection well specifically within identified EJ communities living near the project is shown in Figure 4, below.

Figure 4: Example GS EJ Community Stakeholder Strategy



Step 6: Consider Potential Mitigation Measures

UIC Program Directors can work with owners or operators during the application review process to develop appropriate measures that would reduce or mitigate any potential impacts of a proposed Class VI well. For instance, UIC Program Directors might work with owners or operators during the application review process to help reduce any adverse impacts from well construction and operational activities, or by requiring additional monitoring in areas with identified EJ communities that may be impacted by the activities. Other mitigation measures can involve encouraging owners or operators to improve environmental amenities for the communities identified within the delineated AoR (e.g., provide resources for clean-up of degraded public areas), or requesting that the owner or operator ensure broad advertisement in all communities about potential employment opportunities at the proposed project site.

Step 7: Evaluate and Document EJ Analysis

Once the core activities for an EJ analysis and the required public participation activities have been completed, UIC Program Directors and owners or operators can evaluate any lessons learned throughout the process. One way to accomplish this is to conduct surveys and focus groups in the identified EJ communities to assess what information about the proposed Class VI project site was absorbed, and to determine if any community concerns about the environment, health, and economic well-being still exist.

UIC Program Directors might also consider documenting the following:

- Any EJ analysis processes conducted during the permit review;
- Steps taken to ensure meaningful public involvement; and
- Any mitigation measures implemented within identified EJ communities within the AoR.

Documenting the response to public comments received during the public participation process is required at 40 CFR 124.17. Documenting the EJ analysis undertaken and any lessons learned can also improve any future Class VI permit review, and help improve community understanding and acceptance of future projects.

III. EXAMPLE OF AN ENVIRONMENTAL JUSTICE ANALYSIS

To provide an example of an EJ analysis at a planned GS site, the following discussion is an adapted summary of an assessment conducted by the U.S. Department of Energy (DOE) for the proposed FutureGen carbon sequestration project in Illinois. The assessment was conducted in 2007 as part of the required Environmental Impact Assessment (EIA) under the National Environmental Policy Act (NEPA).

As part of its assessment of FutureGen, DOE conducted an EJ analysis at all the potential geographic sites for the proposed project, including Mattoon, IL.[5] DOE examined the area within 50 miles of the boundaries of the proposed power plant, sequestration site, and injection reservoir (at Mattoon, the proposed sequestration site and reservoir are located on the same property as the proposed plant site).

DOE collected demographic information from the U.S. Census Bureau to characterize low-income and minority populations within 50 miles of the proposed site. To locate and characterize minority and low-income populations near the site, DOE used national, State of Illinois, regional, and individual county data. The data presented in Figure 5 shows the composition of minority and non-minority populations, as well as low-income population percentages, near the Mattoon site. Using these data, DOE assessed the potential for EJ impacts based on the following criteria:

- A significant and disproportionately high and adverse effect on a minority population; or
- A significant and disproportionately high and adverse effect on a low income population.

[5] In February 2011, Morgan County, Illinois was selected as the preferred site for the FutureGen project.

Figure 5: Population Distribution near Proposed FutureGen Mattoon IL Site (2000 U.S. Census Data)

County	White (%)	Black (%)	American Indian (%)	Asian (%)	Hispanic or Latino [all races] (%)	Low-income (%)
Coles	95.4	2.3	0.2	0.8	1.4	17.5
Clark	98.8	0.2	0.2	0.1	0.3	9.2
Cumberland	98.8	0.1	0.2	0.2	0.6	9.5
Douglas	97.3	0.3	0.2	0.3	3.5	6.4
Effingham	98.7	0.2	0.2	0.3	0.7	8.1
Moultrie	98.9	0.2	0.2	0.1	0.5	7.8
Shelby	98.9	0.2	0.1	0.2	0.5	9.1
Champaign	78.8	11.2	0.2	6.5	2.9	16.1
…..	…..	…..	…..	…..	…..	…..
All Counties	94.6	3.4	0.2	0.7	1.1	10.8
Illinois	73.5	15.1	0.2	3.4	12.3	10.7
U.S.	75.1	12.3	0.9	3.6	12.5	12.4

Adapted from USDOE FutureGen EIS.

With regard to racial distribution in the vicinity of the Mattoon site, one county that stands out from an EJ perspective is Champaign County, where the non-white population is 22.2 percent of the total population. However, in none of the counties in the vicinity of the proposed GS project, including Champaign, did the minority population exceed the general population of the State of Illinois or the U.S.

The percentage of low-income populations by county in the Mattoon area is generally comparable to state and national percentages. Low-income populations exceeding the state and national average occur in Coles County (17.5%) and Champaign County (16.1%), but incomes in the majority of households in the region are above the poverty level.

DOE also examined potential construction and operational impacts on the populations in the Mattoon vicinity. Construction of project facilities might temporarily affect air quality, water quality, transportation, and noise levels in the vicinity. Facility operations might have also have short term aesthetic, transportation, noise level, and socioeconomic effects. However, short-term beneficial impacts might include an increase in employment opportunities and higher wages, or supplemental income through jobs created during facility construction. Long-term beneficial impacts of facility operation could also include increases in employment opportunities and potentially higher wage jobs in the future.

Based on an analysis of the demographic information and the potential impacts and benefits of the proposed project, DOE concluded that disproportionately high adverse impacts on minority or low-income populations near the Mattoon site were not expected as a result of permitting a Class VI injection well at this particular location.

IV. RESOURCES

National Environmental Justice Advisory Council. *Nationally Consistent Environmental Justice Screening Approaches: A Report of Advice and Recommendations*. May 2010. Available on the Internet at: http://www.epa.gov/environmentaljustice/resources/publications/nejac/ej-screening-approaches-rpt-2010.pdf.

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World Resources Institute (WRI). *CCS and Community Engagement: Guidelines for Community Engagement in Carbon Dioxide Capture, Transport, and Storage Projects.* November 2010. Available on the Internet at: http://www.wri.org/publication/ccs-and-community-engagement.