Scope of Work #10:

Developing Standards and Metrics to Target the Conservation of "Green Spaces" in Underrepresented and Low-Income Urban and Rural Communities

Community Sustainability Model Research

Introduction

The tasks involved in developing standards and metrics to target the conservation of green spaces in underrepresented and low–income communities throughout the Chesapeake Bay watershed included first mapping those communities and the levels of green spaces. To do so, a web based tool called the "Green Space Equity Mapper" has been created to serve as a platform to both map the green spaces and analyze access to them. In addition to the Green Space Equity Application and the metrics discussed in the outcomes of this project, future efforts to advance the conservation of green spaces in low-income communities of color can be achieved by creating a "community sustainability" or "community livability" model. Such a model would include and weight the contributions of conserved green spaces to local environmental, social, and economic uplifts, include protocols for the engagement of community leaders in setting priorities, and data to measure those conditions and track uplifts over time. Creating a model and a set of strategies can help support the long term needs of the Chesapeake Bay region in particular, through helping to increase acquisitions of "green spaces" in the communities mapped by giving priority funding, increasing environmental restoration where needed, creating uplifts in community and environmental health, economic values of properties while avoiding gentrification, improving community cohesion, and increasing quality of life. The purpose of this research document is to explore and summarize existing models, strategies, and best practices that may inform how a future sustainability model is created for the Chesapeake Bay Watershed region.

Existing Models and Tools:

- NeighborSpace Baltimore Livability Model
- Inland Bays Watershed Sustainability Model
- EPA Creating Equitable, Healthy, And Sustainable Communities
- EPA's Regional Vulnerability Assessment
- NatureServe Vista
- UrbanFootprint
- Academic Articles:
    - Participatory development of a new interactive tool for capturing social and ecological dynamism in conservation prioritization
    - Integrating Biological and Social Values When Prioritizing Places for Biodiversity Conservation
    - Current role of social benefits in ecosystem service assessments

Primary Model: NeighborSpace Baltimore Livability Model

An example of such a livability model that has been developed in the Chesapeake Bay watershed region is from NeighborSpace of Baltimore County (NBCI). NCBI has developed this model through extensive stakeholder outreach and GIS modeling that works to incorporate direct feedback from stakeholders on priorities in their community and quantifies each factor to ultimately create an overall score. The GIS Model uses a linear weighted model to combine 14 indicators into a single overall score, that grades the fitness of a parcel to provide open space services to the public, surrounding businesses, or to the natural environment. The 14 indicators are grouped into 4 goals of Social, Economic, Environmental Restoration and Environmental Conservation. The analysis was performed at the parcel level scale giving a single value for each indicator for each parcel.

The overall Social goal was weighted 0.23, which had indicators for open space, Multifamily Housing, and the Vulnerable Populations Index value. The overall Economic goal weighed 0.18, with indicators for Building Permits, Moderate Value Assessments, and Under Used Impervious Surfaces. The overall Environmental Conservation goal weighed 0.24, with indicators for Core Habitat, Habitat Connectivity, Forest Preservation, Stream Buffer Forest Preservation, and Wetlands Preservation. Lastly, the overall Environmental Restoration goal weighed 0.35, with indicators for Potential for Constructed Wetlands, Potential for Reforestation, and Stream Buffer Reforestation Potential. Each of the indicators was multiplied by their weight and summed to give a score for the overall goal. The goals were then multiplied by their weights and summed to give the overall score. The weights were obtained from a pairwise comparison survey of NBCI and other stakeholders.

NeighborSpace asked questions for each goal to guide these weights assigned in the model. The pairwise survey was then used to ask stakeholder their opinions on what kind of objectives can be set to achieve these goals, what kind of GIS data can describe the objectives, and what is the relative importance of each objective. Answers to the last question directly informed and dictated the weighting of each indicator in the model. The result was an overall score given to each parcel within Baltimore County that rates the fitness of a parcel to provide open space services based on the priorities and relative importance of factors according to stakeholders.

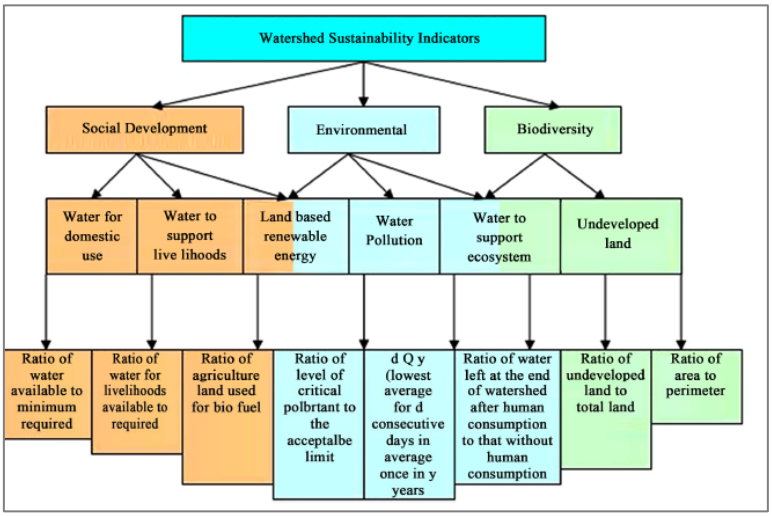
Limitations in Scale

Duplicating the efforts of NCBI and scaling this process up to the watershed wide scale for this project yielded some limitations. Due to the length and budget of this project, conducting in depth community outreach and gaining stakeholder input to inform the model weights posed challenges in reaching all relevant parties throughout the watershed. The size of the region itself and level of sustained feedback and survey responses needed to have an accurate representation was a limitation in creating a model. Another challenge was the availability of GIS or tabular data at the watershed wide scale. As the NCBI model relied on the parcel level scale, gathering compatible data across the watershed posed a challenge in ensuring data from all states and municipalities was available and consistent for parcels, building information, permits and property values.

Other Regional Sustainability Model and GIS Tool Research

Inland Bays Watershed Sustainability Model

While the NCBI model is an excellent example of creating a model at the local scale, there are additional models and strategies that offer best practices in scaling up this work to a regional/ watershed wide level. The following resources offer examples and tools used at a larger scale to help achieve similar equity and conservation goals. A watershed model was created and used for the Inland Bays watershed in Delaware, that looks at hydrological/water quality to measure watershed sustainability over time. In this model, watershed sustainability is quantified by defining and weighting social, environmental and biodiversity indicators to create a "River Basin Sustainability Index". The watershed sustainability was then determined based on reliability, resilience and vulnerability. Similar to NCBI, this model weights the environmental, social and biodiversity factors according to region specific needs and is shaped by the priorities in a concerned region or watershed and how policymakers perceive the future threats. Indicators used in this model include:



Though this model is targeted more toward water quality monitoring, the process in which watershed wide indicators are modelled here can serve as an example for other models of this scale. The results of this model found many policy implications by providing a tool to policy makers, land use planners, zoning officials, watershed managers to look at land use in a holistic way by working across political boundaries. This model acknowledges its lack of an economic indicator and can be built upon in future efforts to better represent the social sustainability aspect of this work.

EPA: Creating Equitable, Healthy, And Sustainable Communities

Another resource that offers standards, best practices and strategies for engaging communities/ stakeholders is the "Creating Equitable, Healthy, And Sustainable Communities: Strategies for Advancing Smart Growth, Environmental Justice, And Equitable Development" guide from EPA. While this resource is not a GIS model, it provides strategies to connect social, economic, and environmental goals across jurisdiction sizes and offers multiple case study examples that can be applied alongside GIS modeling efforts. This guide offers low-income, minority, tribal, and overburdened communities approaches to shape development that responds to their needs and reflects their values. It identifies strategies that

bring together smart growth, environmental justice, and equitable development principles and that community-based organizations, local and regional decision-makers, and developers can use to build sustainable communities. This resource acknowledges the differences in approaches needed based on scale, and that while land use is a local responsibility, it provides strategies that can be implemented by municipal and regional decision-makers, community-based organizations, private-sector stakeholders, or partnerships between them that best suit the local or regional needs.

This guide offers Seven Common Elements of Smart Growth, Environmental Justice, And Equitable Development to follow when engaging communities:

1. Facilitate Meaningful Community Engagement in Planning and Land Use Decisions
2. Promote Public Health and a Clean and Safe Environment
3. Strengthen Existing Communities
4. Provide Housing Choices
5. Provide Transportation Options
6. Improve Access to Opportunities and Daily Necessities
7. Preserve and Build on the Features That Make a Community Distinctive

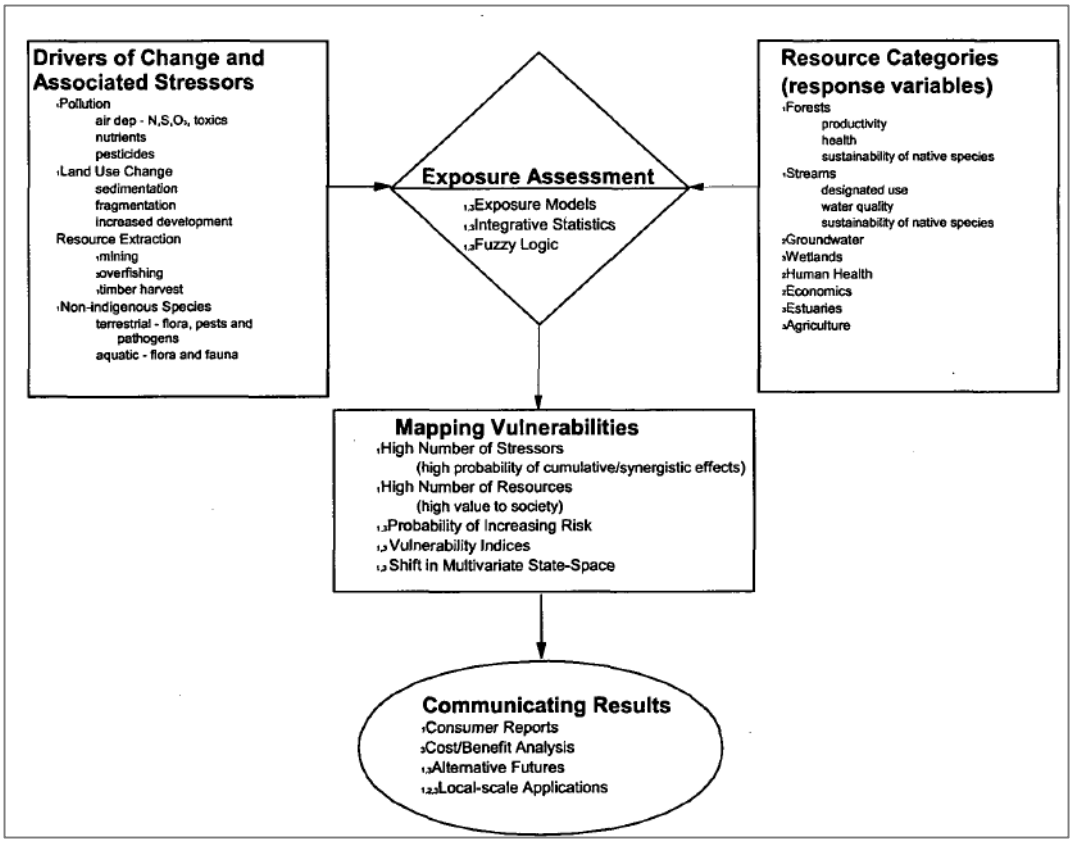
These elements can be used and referenced in future stakeholder survey efforts, similar to that of NCBI, to ask questions and provide indicators that work to meet these goals. In reference to green space in particular, the strategies in this guide emphasize that green space at all scales provides health, social, and environmental benefits for low-income and overburdened communities. Examples of coalitions of community organizations, land conservationists, planners, and public health groups combining funding from local, state, federal, nonprofit, and private sources to create parks and green spaces are provided, as well as case studies that show plans and zoning changes used to protect existing parks and encourage new green space, as well as new policies that have been developed.

EPA Regional Vulnerability Assessment

EPAs Regional Vulnerability Assessment (ReVA) program is another source of best practices in approaching regional scale, priority-setting assessments. The goal of this program was to develop approaches to quantify regional ecological vulnerabilities, to help target risk management activities. ReVAs focus was to develop a set of methods that apply to the range of data available in a given region and provide information to facilitate decision making at the regional, watershed, and local scale. As traditional tools typically are not applicable at broader scales such as the watershed wide level, ReVA explicitly worked to offer strategies and practices using a phased approach for implementation at those scales.

ReVA offers methods for scaling up research and mapping efforts to identify vulnerabilities and project future scenarios. The first phase generally comprises of future projections of land use changes and the associated effects, so that the research priorities in phase two will focus on expanding the range of resources assessed, identifying thresholds associated with various exposures, and refining the integration techniques to better quantify relative risks. ReVA was designed to improve environmental decision making by putting regional scale issues in perspective and emphasizing that vulnerability depends on the rate and intensity of the given stressors. ReVAs approach to assessing vulnerability relied on first mapping the stressors, less sensitive resources, and indicators of exposure, then

integrating those to map vulnerabilities and assessing the risks of impacts to valued resources. Through the development of alternative future scenarios, this assessment ideally helps illustrate how policy decisions and the associated changes in vulnerability affect quality of life.



NatureServe Vista

NatureServe is a wildlife conservation non-profit organization that offers authoritative biodiversity data throughout North America. They have created a scenario-based assessment and planning GIS tool called Vista. This tool is an extension to ArcGIS that supports assessment and planning in any environment that has sufficient data available. The tool helps assess impacts on natural, cultural, and development objectives, and create options for sites. The tool combines data, expert knowledge, and stakeholder values to support ongoing, routine, plan implementation, and adaptive management.

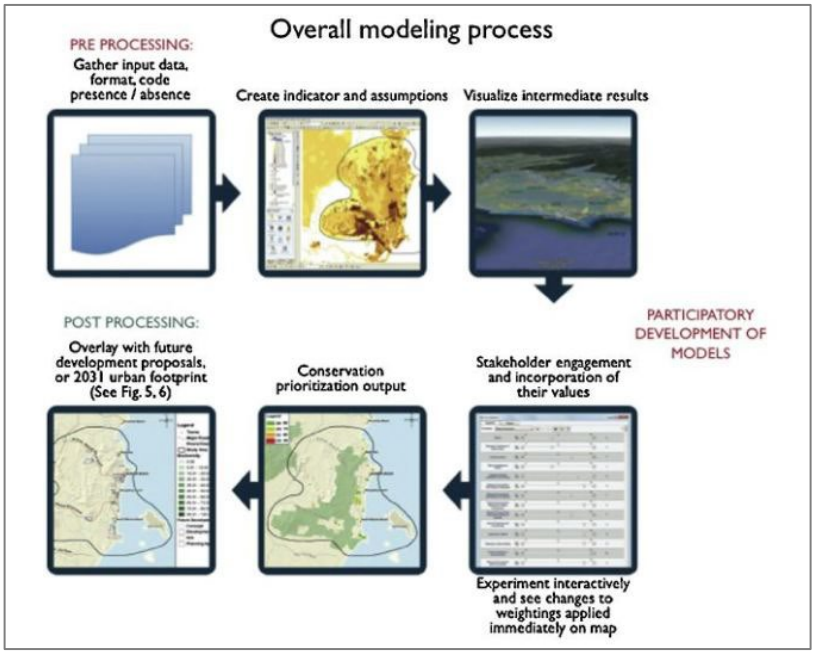
UrbanFootprint

Another scenario-based GIS tool is Urban Footprint. This web-based platform allows users to assess risk and make decisions through using urban, climate, and community resilience data. The built and natural environment can be assessed through identifying existing conditions and land use with urban, environmental, and mobility data. Community resilience can be analyzed by measuring vulnerabilities and impacts at the state, city, and neighborhood level. Climate and hazard risk can be evaluated by visualizing the impact of climate change and natural hazards on communities, resources, and infrastructure.

Academic Articles:

"Participatory development of a new interactive tool for capturing social and ecological dynamism in conservation prioritization"

This article highlights the Collaborative Habitat Investment Atlas (CHIA), a visual participatory tool for conservation prioritization. CHIA promotes stakeholder input through their ability to alter variable weights to reflect different biodiversity protection requirements, and allowing them to immediately see the results visually. The dynamic updating of values and other data allows for rapid feedback on scenario questions and enhances the public engagement processes. Stakeholders can also see spatial descriptions of different levels of protection across the given region. The tool can give results including parcel-based maps that display biodiversity importance, level of protection and threat, as well as maps of habitat prioritization for multi-scale planning. The Collaborative Habitat Investment Atlas is an helpful user-based conservation interactive spatial tool, that allows the rapid adjustment based on stakeholder and habitat values, enables immediate changes to the "optimal" landscape, and models "levels of protection" of multiple habitat laws at many scales.



"Integrating Biological and Social Values When Prioritizing Places for Biodiversity Conservation"

The recognition that many conservation models and research have previously not adequately analyzed both social and environmental factors is also a focal point in this article. This research emphasized that understanding social values in conjunction with biological data is very important for finding socially and scientifically supported conservation planning outcomes. The approach and strategies used to successfully incorporate these data utilizes quantitative data on social values for conservation and social preferences, for development into spatial conservation planning. A public participation GIS survey was utilized in a given region, to spatially represent social values and development preferences along with biological values. Areas of the region were identified where synergies and conflicts between values may occur. Identification of these possible synergies and conflicts can be used to help decision makers target communication strategies and community

engagement to specific areas. The methods and strategies presented in this literature can potentially be very powerful in identifying areas at risk and pinpointing discrepancies in conservation efforts.

"Current role of social benefits in ecosystem service assessments"

This article is a literature review of ecosystem research, in order to see to what degree social values and benefits are addressed. The analysis considered a range of social benefits that may be useful to consider in future conservation efforts that engage the community and stakeholders. The table below shows the social benefits considered and literature environmental assessment sources that address them:

Social benefit types considered in this study.

Social benefit type	Description	Examples	Literature
Therapeutic	The provision of medicines, clean air, water and soil, space for recreation and outdoor sports and general therapeutic effects of nature on people's mental and physical well-being	- Health services - Restorative and regenerative effects on people - Socio-economic benefits from reduced health costs and conditions	De Groot et al. (2003); Brown (2005); Turner et al., (2003)
Economic opportunities	to provide a work place, income, economic opportunities	- Provision of work place, income, economic opportunities	Brown and Reed (2000)
Amenity	Importance of nature for cognitive development, mental relaxation, artistic inspiration, aesthetic enjoyment and recreational benefits	- Aesthetic quality of landscapes - Recreational use - Artistic use	De Groot et al. (2003); Brown and Reed (2000)
Heritage	Importance of nature as reference to personal or collective history and cultural identity, also for educational purposes	- Historic sites and features - Role in cultural landscapes - Cultural traditions and knowledge - Education	De Groot et al. (2003); Brown and Reed (2000)
Spiritual	Importance of nature in symbols and elements with sacred and religious significance	- Sacred sites and features - Role of nature in religious ceremonies and sacred texts	De Groot et al. (2003); Brown and Reed (2000)
Existence	Importance people because they obtain moral satisfaction by conservation of biodiversity (intrinsic value)	- Expressed (through donations, voluntary work, etc.) or stated preference for nature protection - Moral satisfaction through conservation and the "warm glow effect"	De Groot et al. (2003); Brown and Reed (2000) Turner et al. (2003) Kahneman & Knetsch (1992)
Option	Importance people attach to having the option to use ecosystem services in the future, within their own lifetime	- Comfort of having the option to use ecosystem services at a later time in their lives	de Groot, Alkemade et al.(2010)
Bequest	Importance people attach to nature for inter-generational equity	- Comfort of knowing ecosystem services will be available for future generations	Brown and Reed (2000)

The results of the literature review in this article show that there does appears to be a general understanding of social benefits provided by ecosystem services in the reviewed ecosystem service assessments. However, there is currently no common understanding on which ecosystem services potentially provide which particular social benefits, and the definition of benefits and values varies significantly in the reviewed case studies.

Considerations

These resources offer a range of tools and methods to use to create a potential community sustainability model. The strategies and factors utilized in a model may differ depending on the region, the range of stakeholder/ community engagement, and the overall conservation or sustainability goals.

These resources highlight how GIS and mapping can be helpful visual community engagement tools, as well as in depth technical models that that act as scenario-based planning and policy tools. The amount technical capacity needed should be considered prior to determining the strategies and complexity of GIS tools to use when creating a sustainability model, as well as the intended level of community and stakeholder outreach.

Sources

- Neighbor Space of Baltimore County (NBCI) Livability Model
    - NCBI Website Resources
        - "GIS Model- For Maximizing Livability Through Land Conservation & Improvement"
    - Model PowerPoint Presentation
    - GIS Model Writeup

- Inland Bays Watershed Sustainability Model

- Creating Equitable, Healthy, And Sustainable Communities: Strategies for Advancing Smart Growth, Environmental Justice, And Equitable Development"
    - EPA Creating Equitable, Healthy, and Sustainable Communities Webpage

- EPA's Regional Vulnerability Assessment

- NatureServe Vista

- UrbanFootprint

- Academic Articles:
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    - "Integrating Biological and Social Values When Prioritizing Places for Biodiversity Conservation"
    - "Current role of social benefits in ecosystem service assessments"