

An aerial, black and white photograph of a city skyline, likely New York City, viewed from a high vantage point looking down a street. The image is partially obscured by a solid green horizontal bar at the bottom. The sky is filled with dramatic, dark clouds. The city buildings are dense and varied in height, with a prominent skyscraper visible in the distance.

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BNIA RECOMENDATION REPORT

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BNIA GREEN PATTERNS MAPPING TOOL

REPORT OUTLINE:

- **CURRENT TOOL**
- **INTERVENTION ANALYSIS**
- **CHALLENGES**
- **USER-EXPERIENCE**
- **TECHNICAL**
- **SUPPLEMENTAL MAP LAYERS**
- **CONCLUSION**

**BNIA GOAL: TO
STRENGTHEN
BALTIMORE
NEIGHBORHOODS BY
PROVIDING
MEANINGFUL,
ACCURATE, AND OPEN
DATA AT THE
COMMUNITY LEVEL**

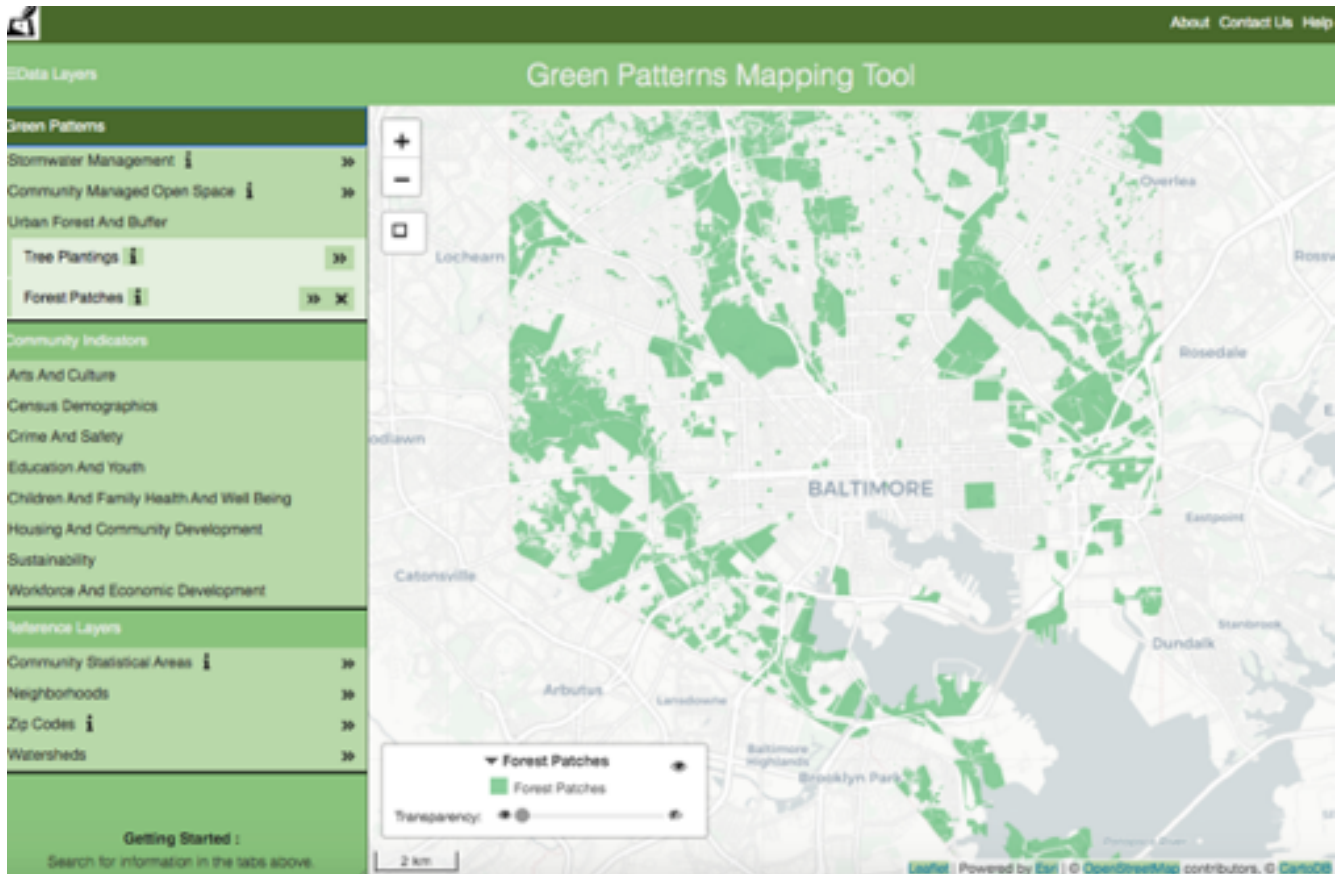
Climate Change increases global temperatures, inciting warming oceans, melting ice sheets, and increased extreme events. The phenomena has large implications on cities, prompting detrimental urban effects like coastal flooding, soil deterioration, and Urban Heat Island.

Additionally, the planet is experiencing population growth, with urban areas expected to absorb all future growth. The combination of rapid urbanization and Climate Change poses large responsibility on cities to become adaptable, smarter, and resilient with minimal guidance.

This report describe how BNIA can effectively contribute to the Sustainable Urban Development (SUD) discussion in Baltimore.

Specifically, the report will offer recommendations on the Green patterns Mapping tool to make it more conducive for SUD stakeholders.

CURRENT TOOL



[HTTPS://GREENPATTERNS.BNIAJFI.ORG/](https://greenpatterns.bniajfi.org/)

BNIA Green Patterns Mapping Tool includes regional geospatial data to both educate and empower stakeholders to partake in Baltimore's sustainable urban planning process.

Shown above is the current tool, with the former "BNIA Water Map" disabled due to slow processing speed and out-of-date technical infrastructure.

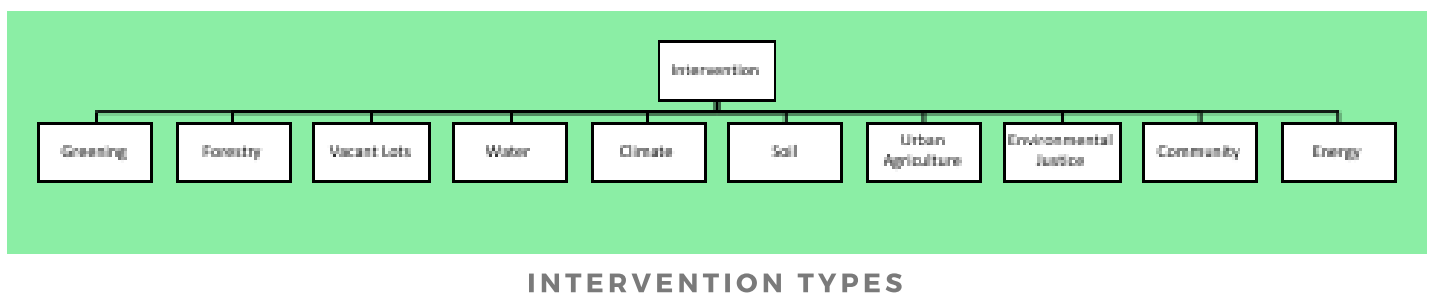
The tool was created using Leaflet, an open-source JavaScript software, that displays ESRI geospatial data. The database includes four Green Pattern Layers: Stormwater Management, Community Managed Open Space, Tree Plantings, Forest Patches. Additional Community Indicators and Reference Layers were added to provide local context.

.When accessing the tool, the current pop-up includes a "Welcome" message and "About" button provides rationale for the database. A special feature includes clicking on sites and seeing live visuals via Google StreetView.

BALTIMORE SUSTAINABLE DEVELOPMENT INTERVENTIONS

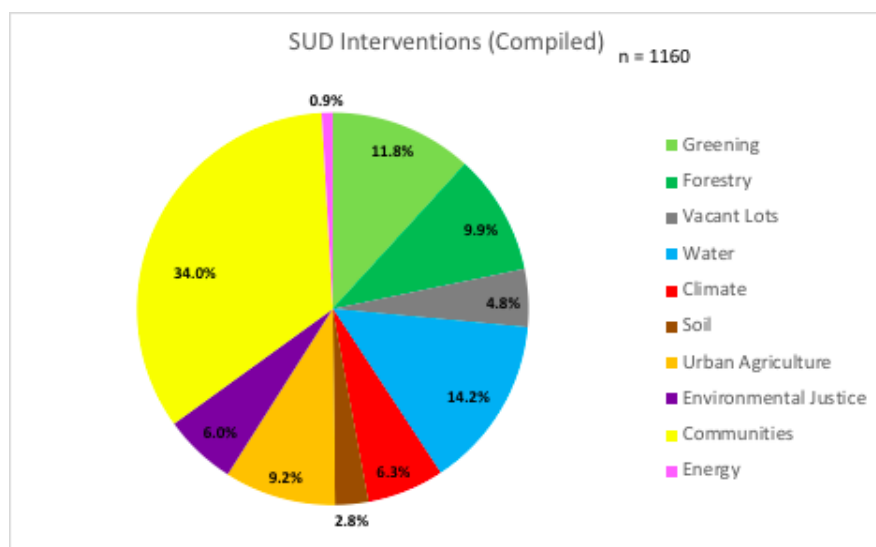
Semi-structured interviews were performed with eleven (n=11) stakeholders involved in Baltimore's sustainable urban planning field.

They were asked questions regarding: current interventions, challenges faced within the field, and recommendations to the BNIA tool.



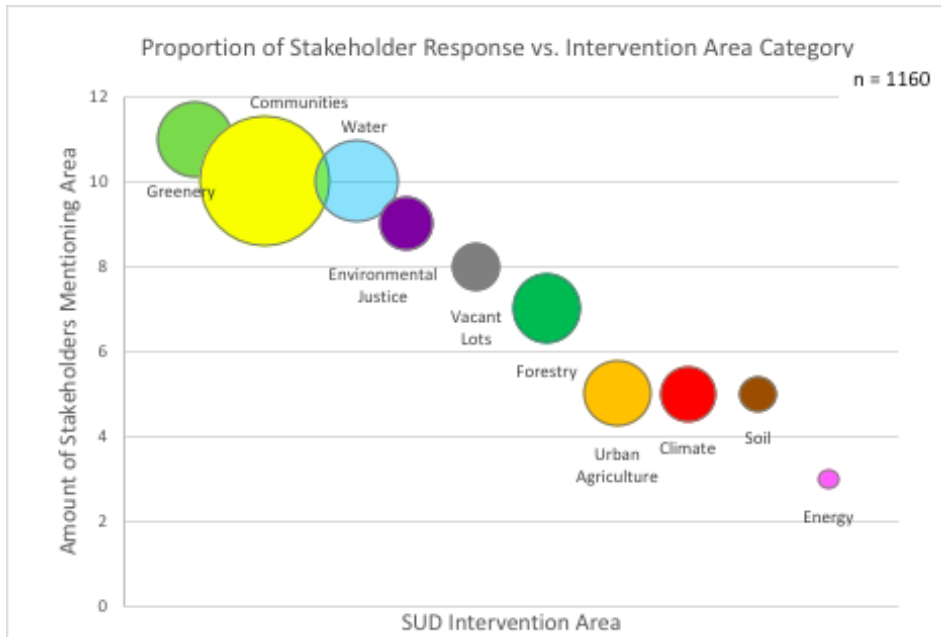
Using qualitative coding of transcribed interviews, Stakeholders performed ten major Intervention areas. When averaging stakeholder response, it was deemed Community-based interventions was discussed the most (34%), followed by Water (14.2%), and Greening (11.8%).

Discussed the least was Energy (.9%), Soil (2.8%), and Vacant Lot (4.8%) Interventions.



COMPILED INTERVENTION BREAKDOWN

INTERVENTION STRENGTH



Relative frequencies of Intervention responses were taken to indicate strength. Higher numbers on the y-axis indicate more stakeholders discussing the Intervention type. X-axis shows Intervention categories and the size of bubble indicates strength, as larger bubbles were discussed more frequently. While Greening was mentioned by all stakeholders (n=11), Community-based intervention (n=10) had a much higher strength. Likewise, Urban Agriculture, Climate, and Soil were mentioned by half of stakeholders (n=5). However, urban agriculture was discussed much more frequently than climate, and almost 3x as much as soil interventions.

OBJECTIVE I: PLACE GREATER FOCUS ON COMMUNITY-BASED INTERVENTIONS, MAP LAYERS, AND INVOLVEMENT



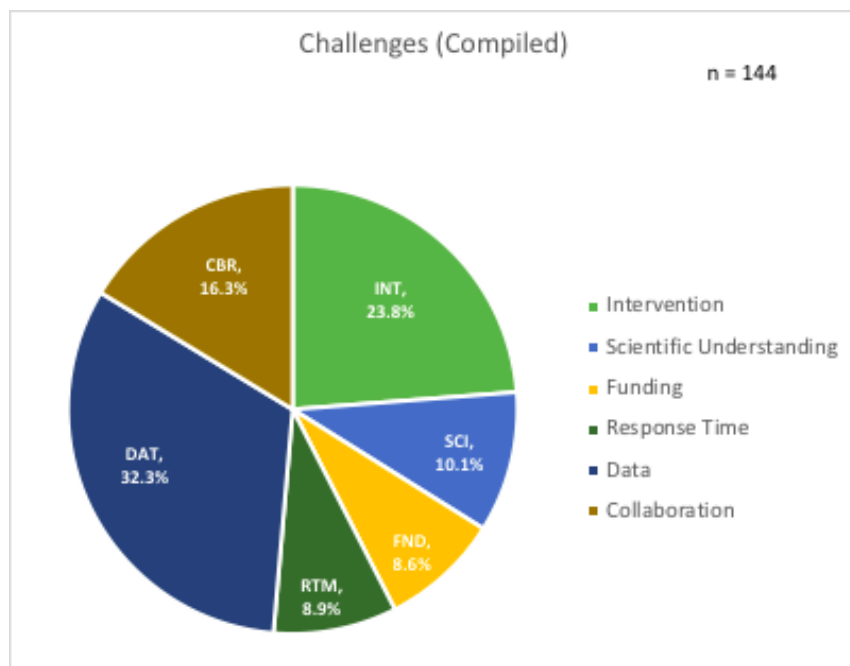
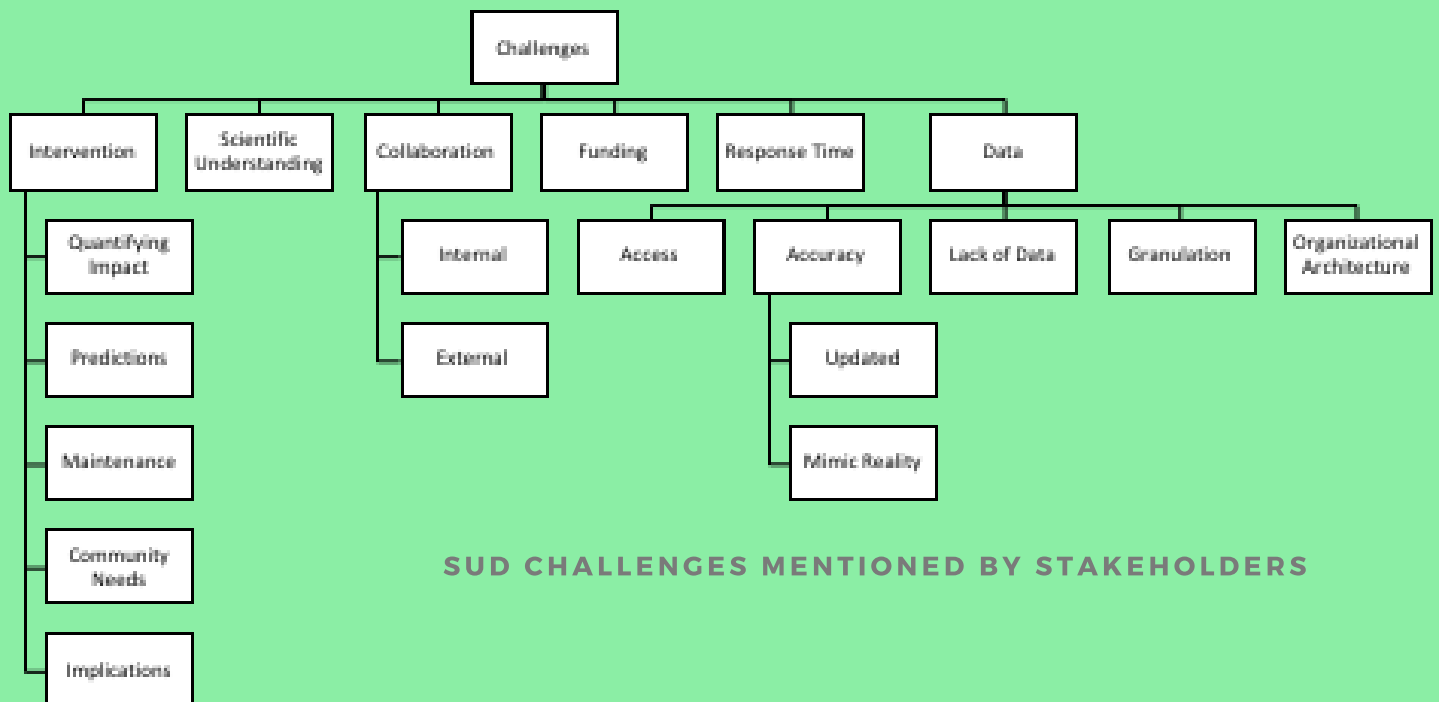
STRATEGIES TO ADDRESS COMMUNITY INTERVENTION

The data suggests an overwhelming importance of community within sustainable development work. Three strategies were created to address community, with the first being to increase the number, granulation, and quality of already existing Community Indicator layers. This is the most feasible recommendation, as it works with existing BNIA data infrastructure.

The second step to add a crowdsourced feature to the Green Patterns Map. BNIA has an existing GEOLoom database, unique for allowing communities to upload local art and cultural projects onto the open-sourced site. Expanding this technical capability to the current map will allow for communities to input greening, forest, and stormwater management projects.

The current map does not include qualitative data, and this void can be filled in step #3. Adding qualitative data like personal quotes from community members, pictures of greening interventions, and neighborhood survey data will add new, impactful perspectives.

CHALLENGES



COMPILED CHALLENGE BREAKDOWN

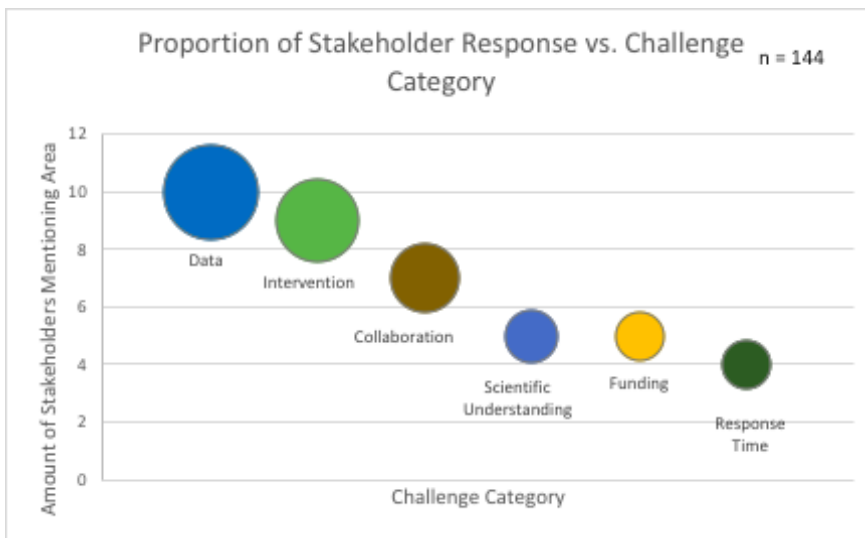
Stakeholders mentioned six main challenges they face in the field of SUD: problems with SUD-specific interventions, lack of scientific understanding, collaboration efforts, lack of funding, response time, and data

Stakeholders overwhelmingly mentioned barriers regarding Data (32.3%), moderately mentioned Intervention-related challenges (23.4%), and then Collaboration (16.3%)

These challenges present opportunities for BNIA to expand their scope of influence.

Collaboration: It is recommended that BNIA initiate collaborative projects, partner with a multitude of SUD stakeholders, and increase external involvement.

CHALLENGE STRENGTH

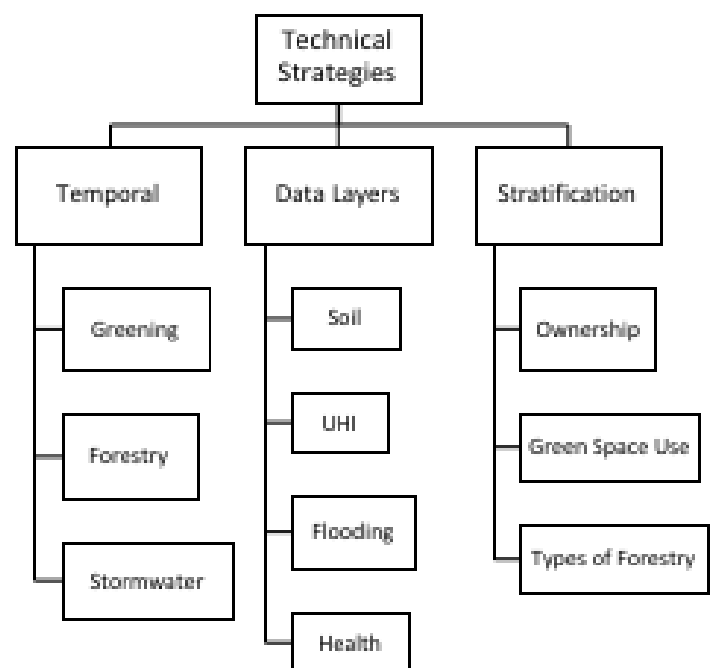


OBJECTIVE II: ADDRESS DATA CHALLENGES THROUGH SPECIALIZING IN ONE OF THREE TECHNICAL STRATEGIES

- 1) Temporal:** Stakeholders overwhelmingly discussed the challenges of finding temporal data, future modeling, and measuring effectiveness over time. It is recommended BNIA works to include a temporal component, providing stakeholders with greening, stormwater, and forestry over time.
- 2) Data Layers:** BNIA can work to expand data layers to make it more applicable for greater number of stakeholders. Greening heavily overlaps with other SUD sub-areas, and it is recommended BNIA adds soil, UHI, flooding, or health data layers.
- 3) Stratification:** Rather than adding additional components, BNIA could specialize existing data. Stratifying by type of ownership (government vs. community managed), green type (recreational vs. garden), or forestry (tree types, date of planting, etc.)

Relative frequencies of Challenge responses were taken to indicate strength. Higher numbers on the y-axis indicate more stakeholders discussing the Challenge type. X-axis shows Intervention categories and the size of bubble indicates strength, as larger bubbles were discussed more frequently. Synonymous with the Challenge pie chart, Data was mentioned by highest number of stakeholders (n=10) and had largest strength.

Stakeholders were then asked how BNIA could improve their technical data infrastructure. Sentiments are summarized in the Technical Strategies chart below. These strategies will allow the Green Patterns tool to become more nuanced, specialized, and effective for stakeholders.



TECHNICAL STRATEGIES FOR GREEN PATTERNS

USER-EXPERIENCE RECOMMENDATIONS

PROBLEM

1) **User-Experience**

generally positive, but described as “confusing to use” at times

2) **Pop-Up**: content and technical remarks

3) Lack of **Widgets**

4) **Legend**: Confusion and difficulty locating

5) **Mapping Literacy**

6) **Speed**: Uploading and data speed deemed slow

7) **Mobile complaints**: Database described as “clunky” and “oddly-oriented” when used on mobile devices

RECOMMENDATION

1) Create tutorial on how to use greening database by making **a)** clickable tutorial **b)** adding more information to pop-up screen **c)** creating hyperlinked YouTube tutorial video **d)** hyperlinked pre-made maps for inspiration

2) effective pop-up by **a)** including “do not show again” button **b)** include more effective content (adding About info to pop-up)

3) Include widgets that allow for **a)** print function **b)** Share function **c)** downloadable data **d)** access to Street View

4) Making legend more user-friendly by **a)** having different color than background **b)** placing it on upper right side **c)** moveable legend

5) improving mapping literacy by **a)** automatically place boundary around Baltimore City **b)** Automatic zoom into selected layers **c)** contrast layer colors with backslash

6) Increase processing speed of database by **a)** retrieving certain queries at a time **b)** simplifying processing system **c)** obtaining private server

7) Re-evaluate mobile database use by **a)** presenting database horizontally **b)** restricting certain features **c)** creating separate app

TECHNICAL RECOMMENDATIONS

PROBLEM

1) **Data Sourcing:**

Stakeholders had questions over where data was sourced and what data was included

2) **Data Accuracy:**

Questions surrounding how often data is updated

3) **Data Granulation:**

Questions about resolution of data

4) **Layering:**

BNIA uses CSA (community statistical area) spatial data versus much data comes as spatially distinct by Neighborhood

RECOMMENDATION

1) Tool can have increased data literacy by **a)** having widget that directs to data inventory **b)** ability to show different data sources per layer **c)** stratification of each Green Patterns layer to increase transparency

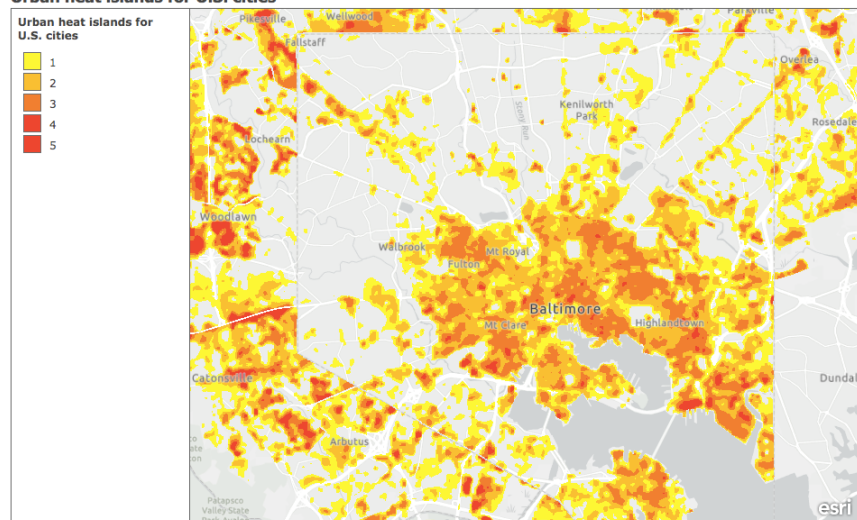
2) Increase up-to-date data by **a)** having “Data last updated” marker in lower right corner **b)** Having live monitor of each Green Patterns Map

3) Increase transparency by **a)** including link to meta-data information **b)** include resolution information on clickable data layers

4) Increase ability to layer data by **a)** turning Neighborhood data into CSA data **b)** Noting technicalities on Pop-Up **c)** hyperlinking tutorial / YouTube video on differences

ADDITIONAL MAP LAYERS

Urban heat islands for U.S. cities



This image service contains the relative heat severity for every pixel for every city in the United States. This 30-meter raster was derived from Landsat 8 imagery band 10 (ground-level thermal sensor) from the summers of 2018 and 2019.

Map Layer: Urban Heat Island Source: Lanset, USDF

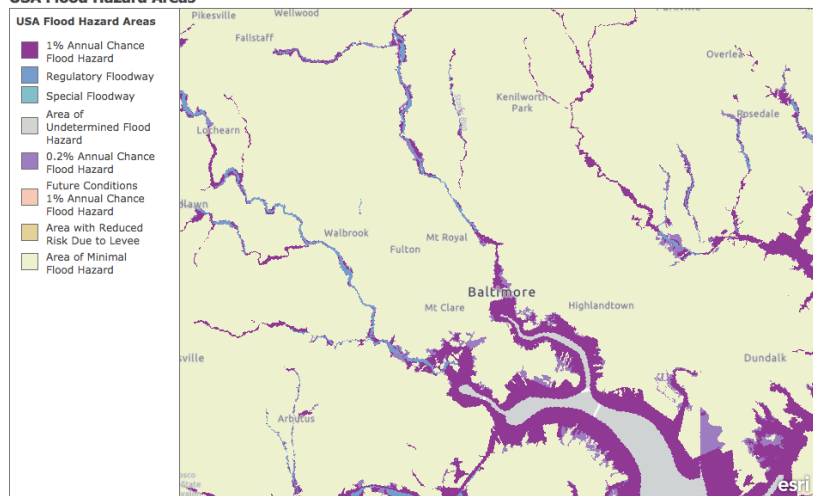
The UHI effect is growing in importance for municipal areas. Overlapping UHI with greening may highlight areas in critical need of; greening, sustainable intervention, or community outreach

Map Layer: Flood Insurance Rate Source: FEMA

Stakeholders discussed the impacts of flooding on infrastructure, soil, forestry, and communities.

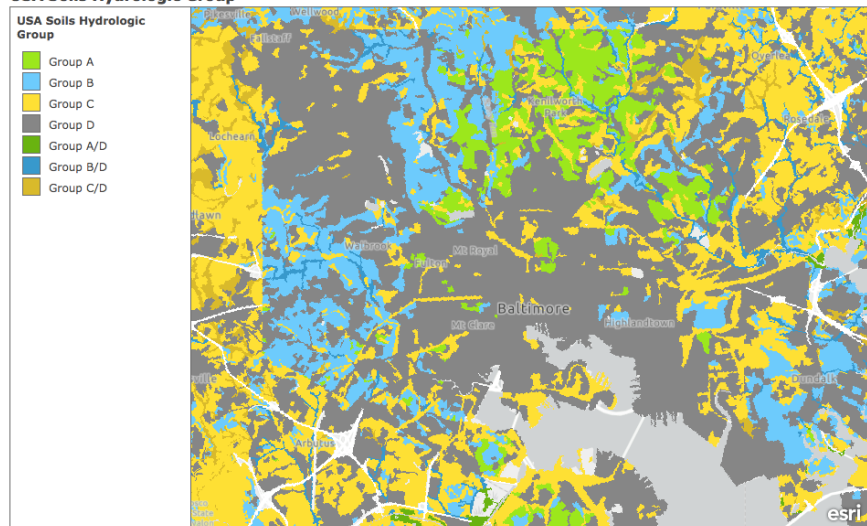
Including Flood maps may shed light on critical coastal and non-coastal areas in need of additional sustainable intervention.

USA Flood Hazard Areas



This layer displays Flood Hazard Areas from the Flood Insurance Rate Map created by the Federal Emergency Management Agency.

USA Soils Hydrologic Group



This layer displays hydrologic soil group in seven classes that describe the rate that the soil absorbs rainfall.

Map Layer: Soil Hydrology Source: EPA

Soil is interconnected to a wide range of interventions (greening, forestry, urban agriculture) and arguably, is the basis for all urban ecologic systems.. Including soil information could highlight the interconnections between all fields.



CONCLUSIONS

Stakeholders interviews proved successful in informing research and recommendations behind BNIA's Green Patterns Mapping tool. Overall, stakeholders perceived the tool as "unique", "interesting", and "different". However, each stakeholder had opinions about the data, layout, and infrastructure of the tool.

BNIA can invest time into reforming technical and user-experience aspects to bolster the effectiveness of the tool, making it more attractive to stakeholders.

The tool itself speaks to the larger relationship between data and intervention. By expanding geospatial data, this may empower further sustainable development projects within Baltimore City.