Scope and Scale in Adaptation Planning: Findings from ART

ADAPTING TO RISING TIDES PROJECT

JULY 2014

The Adapting to Rising Tides (ART) project helped answer two fundamental questions about the appropriate scope and scale of adaptation planning:

> *Question 1: How does scope and scale, including the geographic extent of the project area and the assets or sectors included, affect assessment and planning outcomes?*

> *Question 2: How can adaptation planning clearly and transparently identify and communicate issues that cut across different asset and geographic scales?*

In order to answer these questions, the project scope included a number of different asset categories, multiple jurisdictions, and varying asset and geographic scales of assessment. This approach shed light on the benefits and constraints that scope and scale play in adaptation planning.

Geographic Scale Matters

The assessment of larger geographic areas can help identify interconnected, or cross cutting, issues and functional vulnerabilities. For example, physical infrastructure at the Port of Oakland Seaport may be relatively resilient to flooding and other storm impacts, but continuity of seaport function is highly susceptible to regional rail system disruptions. The assessment of smaller geographic areas, for example at the neighborhood, site or place-based scale, can identify specific characteristics or conditions that underlie vulnerability and risk. It is generally the case that the smaller or more refined the geographic scale the more the specific the assessment outcomes will be.

Undertaking assessments at multiple geographic scales can provide broad benefits by uncovering key insights into the cross-cutting nature of vulnerability and risk. For example, interconnected networks, such as ground transportation, utilities and shoreline protection, are vulnerable because local disruptions can have broad cascading affects on both nearby and distant assets and result in system-wide (and at times catastrophic) failures.

Geographic Scales in ART

The ART project area, or subregion, included almost all of Alameda County. Within the subregion there are six cities and one unincorporated community. Also in the subregion are a number of parks and utility districts, local agencies and organizations, neighborhoods, and individual facilities. Considering all of these geographic scales help to uncover the benefits and constraints of understanding vulnerability, risk and response of each scale, and highlighted issues that cut across geographies.

A multi-scale approach can highlight potential consequences that reach across geographic areas. For example, there could be site-specific consequences if a stormwater pump station failed, while disruption of a power substation could likely have neighborhood-scale consequences. Additionally, the vulnerability of many of the asset categories considered in the ART project area could have significant consequences at multiple scales. For example, there could be neighborhood-scale consequences if Interstate 880 near the Oakland Coliseum was damaged due to increased traffic on local roads, regional consequences on commuters, employers and manufacturers, and state-wide consequences on goods movement.

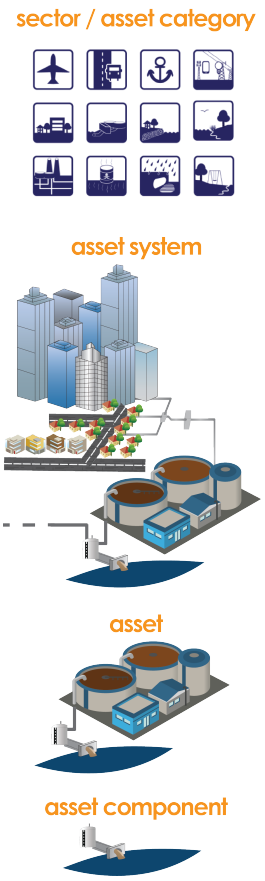
Asset scale matters

Focusing on single asset categories or sectors can provide a deep understanding of vulnerability and can lead to implementation of specific actions, but may overlook vulnerabilities due to physical or organizational relationships among assets or agencies that are revealed when considering multiple sectors together. In addition, multi-sector assessments can highlight how seemingly dissimilar assets, such as nursing homes, single access roadways, trails used by those with limited mobility, and tidal marshes that support threatened or endangered species, have similar vulnerabilities due to their unique function. Multi-sector analysis can also identify complexities in regulatory and other decision-making processes that cut across asset categories, for example actions to address the vulnerability of a roadway that crosses to a tidal creek can have similar regulatory challenges as can measures to improve tidal marsh resilience.

Scaling down to individual or representative assets can identify specific vulnerabilities that are often caused by particular physical and functional characteristics. An assessment at the asset scale can quickly identify specific components, critical functions, or management challenges that will increase the vulnerability of certain assets. For example, some shoreline parks in the project area are owned by one agency and managed by another. This can present a governance challenge that may increase the complexity of adaptation response development, action selection and implementation.

Asset Scales in ART

At the scale of the entire project area the assessment was conducted for each asset category (e.g., wastewater), for asset systems (e.g., a wastewater service district), for individual assets (e.g., a wastewater treatment plant), and for components of individual assets (e.g., a pump station). Some of the individual and component assessments focused on unique assets in the project area while other focused on representative assets in the cases where it was not possible to consider all individual assets within an asset category.



Asset Scale	Example	Scale of the Assessment
Sector	Utility	Overarching utility sector issues identified
Asset Category	Wastewater	Entire wastewater asset category included to varying degrees, e.g., collection, conveyance, treatment and discharge facilities
Asset System	Wastewater Service District	Two service districts in the project area EBDA and EBMUD considered
Asset	Wastewater Treatment Plant	Five wastewater treatment plants assessed as a single functioning facility
Representative Asset	Effluent Pump Station	Twenty-seven pump stations evaluated as representative conveyance system assets
Asset Component	Interceptor Overflow Structure	Five emergency overflow structures assessed as a component of the conveyance system

Considering individual assets can provide insight into how different asset categories can have vulnerabilities that will likely require similar adaptation responses. For example, assets with below ground or at-grade electrical and mechanical equipment are highly vulnerable to flooding, and the response for most if not all of asset categories is to protect, elevate or re-locate water or salt sensitive components. Information challenges were found during asset-specific assessments for all asset categories evaluated. For example, security concerns restrict access to information about specific energy assets and this lack of publicly available data made it difficult to understand the vulnerability of these assets at any scale, and particularly at the asset-specific scale. The finding that all asset categories had some measure of information vulnerability helps to make the case that it is necessary to provide resources to gather high quality, asset-specific information and to improve access to that information. High quality, accessible information is essential for assessing vulnerability and risk, and for developing, selecting and implementing adaptation actions.

Summary and Conclusions

ART demonstrated that each geographic and asset scale has specific benefits as well as constraints. The ART project area scale informed an understanding of functional and cross cutting vulnerabilities that exist among assets and asset categories that can potentially result in significant or unexpected consequences if not identified and addressed. The project area was also a practical and efficient scale at which to assess vulnerability and risk because it quickly led to the identification of similarities between asset categories, and resulted in the development of adaptation responses that were applicable to a broad range of assets.

A challenge of the project area was the large number of assets due to the geographic size and number of jurisdictions. The sheer number of assets within certain categories (e.g., hazardous materials sites) limited the ability to understand asset-specific vulnerabilities and risks, particularly when combined with a lack of accessibly, high-quality information about these assets. In these cases, in order to bring a finer level of detail into the assessment, the ART project focused on representative assets. This approach resulted in a fairly rigorous understanding of vulnerability and risk, and is a process that can be repeated by others conducting similar assessments.

Conducting assessments at different scales simultaneously in a coordinated manner can be an efficient and practical approach to achieving robust outcomes. Large scale, regional or statewide assessments will need to be grounded in information gathered at the site, neighborhood and local scales if they are to lead to tangible outcomes. They will also need to be advanced through strong partnerships and active participation of those that operate at the local scale and have the best understanding of local issues and characteristics. Smaller scale, neighborhood, site or place-based assessment area, will be more fruitful if supported by broader regional or statewide efforts that highlight the high level and cross cutting issues that will be faced at the local level and help to identify those areas and issues that should be prioritized at the neighborhood, site or place-based scale. Coordinated assessments at different scales can provide a robust understanding of vulnerability and risk, and can identify when action needs to be taken individually or in a coordinated manner, locally or regionally, or at across all scales.