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EXECUTIVE SUMMARY

ZONING FOR SEA-LEVEL RISE:

A Model Sea-Level Rise Ordinance and Case Study of Implementation Barriers in Maryland

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1. Introduction

The 2011 and 2012 hurricane seasons turned a spotlight on the nation's vulnerability to extreme weather events and climate change. The nation watched as Hurricanes Irene and Sandy drown North Eastern states including parts of the nation's economic epicenter, New York City. These types of impacts are only going to increase as the climate changes and sea-levels continue to rise: low lying shorelines will become permanently inundated, storm surges will be driven further inland causing more extensive inland flooding, and shorelines will erode. Extreme events, like hurricanes and nor'easters, will become more extreme and possibly more frequent. These physical changes will cause extensive impacts to coastal development and coastal ecosystems.

Local governments will be on the frontlines of responding to these impacts. Coastal localities in particular will need to confront the difficult challenge of balancing multiple and competing public and private interests in coastal resources in the face of mounting and somewhat uncertain impacts. They have to simultaneously protect people and property from impacts, while also preserving vulnerable coastal ecosystems. Private property owners will want to continue to develop in coastal areas and protect their investments from rising seas. But, the public also has an interest in conserving scarce public funds, and protecting public coastal lands for their recreational and natural resource values.

As a result, governments will need to develop flexible frameworks to regulate coastal development to address these increasing risks. Current floodplain management practices will be insufficient: they do not account for changing climate conditions and they apply similar regulations to all properties based upon historic flood risk. This one-size-fits-all approach is impractical because communities often must regulate across widely divergent terrain—with different risks, states of development, and natural resource values. These characteristics of at-risk lands will lead policymakers to develop different goals for adapting different parts of their community. Thus, legal frameworks must also be adapted to suit this need.

2. Solution: Adaptation through Land-Use Regulations

To help local communities address these challenges, we designed a model sea-level rise ordinance ("model ordinance" or "model") to provide local governments with a template for tailoring regulations to meet the needs of their community and its particularized vulnerabilities. To effectively balance all the competing interests in coastal resources in the face of climate threats, local governments will need flexible and robust land-use regulations. Zoning is the most powerful tool that local governments have to preemptively mitigate hazards. Through planning and zoning, local governments can determine what is at risk, what is safe to build, and where it is safe to build. By analyzing vulnerabilities and planning for impacts, local governments can shape landowner expectations and build political support for adaptive measures. Through regulations, local governments can ensure that fewer people and structures are in harm's way when impacts occur, and that developers site and construct new structures to be more resilient to flooding and other impacts.

The model ordinance employs two strategies for responding to the threats posed by sea-level rise (SLR). First, the ordinance extends the boundaries of the areas subject to floodplain regulations to protect development that will become increasingly vulnerable to impacts as SLR drives flooding further inland. Second, the ordinance designates two special zones (collectively "SLR zones") where enhanced

regulations are imposed; each designed to effectuate the community's adaption goals for different areas:

- A **Conservation Zone** designed to facilitate retreat—to protect natural resources and provide for the gradual relocation of development in highly vulnerable areas. This zone could include highly vulnerable areas that have sensitive natural resources and that are unsuitable for hard-shoreline protection (such as sea walls and bulkheads).
- An **Accommodation Zone** designed to allow for continued development while requiring that structures be sited and built to be more resilient to impacts. This zone could include areas with intense to moderate existing development, some ecologically sensitive resources, and limited viability for hard-shoreline armoring.

For each zone, the model provides language for special development standards that communities could apply to effectuate the goal for that zone.

In the **Conservation Zone**, communities could:

- ***Downzone permitted uses:*** Limit development and redevelopment to low-density and low-intensity uses, such as agricultural, recreational, or open space uses.
- ***Increase setbacks:*** Require that structures be setback on the lot as far landward or upland on a site as feasible ("maximum practicable setbacks").
- ***Limit the size and height of structures:*** Permit only smaller structures that will be more easily relocated, will put fewer people at risk, and will minimize the economic consequences of floods.
- ***Restrict rebuilding***: Prohibit redevelopment of storm-damaged structures in highly vulnerable areas or prohibit redevelopment of repetitive loss structures.

In the **Accommodation Zone**, communities could:

- ***Downzone permitted uses***: Limit new development of critical facilities or require that more intense uses obtain a special use permits.
- ***Increase setbacks***: Apply erosion-based setbacks or tiered setbacks for waterfront properties. Tiered setbacks require that larger structures be setback father from the water line than smaller structures.
- ***Increase structure elevation***: Require that structures be elevated higher to account for projected SLR over the life of the structure (e.g., 3 feet of rise over 60 years).
- ***Limit the size and height of structures***: Permit only smaller structures, but allow for structures to exceed height limits where they are elevated to provide flood protection.

In some highly urbanized areas of the coast, communities may want to employ a protection strategy that uses hard shoreline armoring to protect critical assets from rising seas. Due to state, federal and constitutional laws (such as the Clean Water Act and public trust doctrines), armoring decisions are most often made by state and federal actors, and decisions to armor will not primarily be made by local governments through floodplain regulations. Instead, federal, state and local decision-makers will need to coordinate to establish protection policies for certain regions and certain portions of the coast. Therefore, the model does not primarily address protection policies; instead, the model provides

regulatory language that local governments may be able to include in floodplain ordinances to ensure that the environmental impacts or armoring are mitigated and that armoring projects are designed to protect against higher flood elevations. For example, existing and new armoring projects should be designed with consideration of the long-term rate of SLR so that armoring projects are not overtopped during storm events.

When implementing these policies, local governments will also need to weigh different community-specific tradeoffs to decide where to apply the various adaptation strategies and how to administer the policies. These considerations include:

- ***Issues of design:*** Where to apply the tools, how to draw the boundaries for each zone, and what uses to permit in each zone; and
- ***General administrative provisions:*** How to integrate new SLR regulations into the general administrative provisions of the zoning ordinance, such as whether to require developers to consider SLR in site plans; how to phase out existing uses and structures that do not comply with new SLR regulations (i.e., nonconformities); and how to administer variances within each zone.

3. Analysis: Testing the Ordinance in Maryland

Because models are only as useful as the real-life changes they help to promote, after we developed the model ordinance we tested it in Maryland in order to identify legal or policy barriers to implementation. To determine what adaptive land-use regulations Maryland localities can implement now, with existing authorities, and what regulations may take changes to law.

Legal

The first question local governments must answer before implementing any new regulation is: it is *legal*? To answer these questions, we prepared a Maryland case study in which we analyzed each land-use policy proposed in the model ordinance against federal and state laws to determine whether Maryland localities can legally implement the policy. The case study examines the following legal issues:

- ***Authority:*** Local governments are creations of the state and, therefore, cannot exercise powers that have not been delegated to them by their state legislatures. Maryland is a home rule state, and thus its localities have broad powers to regulate land use to protect the public health, safety, and welfare. Because SLR poses clear public threats, Maryland local governments likely have sufficient authority to use zoning powers to mitigate potential impacts. However, as discussed below, other state laws may preempt or limit local authority to implement specific policies, such as prohibiting hard-shoreline armoring and rebuilding after storm events.
- ***Consistency with federal laws****:* Although land-use regulation is typically a local concern, local governments must ensure that regulations comply with overlapping federal law. We analyzed each policy for consistency with the following federal statutes.

  The ***National Flood Insurance Program (NFIP)*** presents the key obstacle that all communities will need to work around in order to implement an effective response to SLR. To participate in the NFIP, local governments must impose minimum regulations on development in floodplains. However, the Federal Emergency Management Agency (FEMA), the agency charged with administering the NFIP, uses *historic* flood data to determine where minimum regulations must be imposed. While local governments must comply with the NFIP to maintain their community's eligibility for federal flood insurance, the NFIP approach will be insufficient in addressing the long-term threats posed by SLR:

flooding will be driven further inland to unregulated parts of the community, flood heights will increase, and flooding may become more frequent. To address these obstacles the model ordinance uses two strategies. First, the model ordinance proposes that local governments use existing flood zones delineated on NFIP flood insurance rate maps (FIRMs), but extend floodplain regulations inland to previously unregulated parts of the community. For example, the NFIP requires that communities regulate in the 100-year floodplain (i.e., the area with 1 percent chance of flooding in any given year based upon historic flood data). But, FIRMs also show the boundaries of the 500-year floodplain (i.e., the area with 0.2 percent to 1 percent chance of flooding in any given year). The NFIP does not require communities to regulate in these areas, but communities are free to do so. By extending floodplain regulations out to the 500-year boundary, local governments can maintain compliance with the NFIP while building resilience to increased inland flooding. Second, the model proposes that communities divide the 100-year floodplain into two different SLR zones (a Conservation Zone and an Accommodation Zone) and apply enhanced development standards in these zones. This will allow communities to tailor the regulatory approaches they use to build their resilience to flood impacts based upon community's adaptation goals. Finally, it should be noted that Congress recently passed reforms to the NFIP; these reforms give FEMA authority to consider SLR on FIRMs). However, the model relies on existing FIRMs because new maps with SLR projections may not be available for some time and even if SLR maps do become available, they may only be advisory in nature. Therefore, when implementing adaptive land-use measures, communities will need to continue to rely on existing FIRMs in the near term.

The ***Americans with Disabilities Act's*** **(ADA**) accessibility requirements could conflict with requirements to elevate structures as proposed in the model. Although residential structures and many small businesses are exempted from ADA accessibility requirements, numerous businesses and government facilities that are open to the public are not exempt. Any new regulations that require non-residential buildings to be elevated (such as critical facilities and commercial structures) may pose substantial burdens on public entities and businesses that must comply with the ADA. ADA rules apply to both new construction and alterations to existing facilities covered by the Act. Generally, alterations to existing facilities cannot make the building less accessible. To maintain accessibility, the ADA could require that elevators or ramps be installed, unless the structures qualify for an exemption. Therefore, policymakers may want to consider regulatory alternatives to elevation requirements for non-residential structures. Although there are some technical challenges, floodproofing can be used as a tool to comply with the NFIP and ADA accessibility requirements for *non-residential* structures that are not located in coastal high hazard areas (i.e., V-zones). Communities can also consider relocating critical facilities out of the floodplain, where feasible.

- ***Consistency with state law***: Local governments must also ensure that new regulations comply with myriad state laws. In the case of SLR regulations, state law may pose the biggest obstacle to local implementation. In Maryland, we analyzed the following state statutes for potential conflicts with the policies proposed in the model. It is important to note that coastal laws vary considerably state to state; therefore, users of the model ordinance will need to conduct their own analysis to ensure that the model policies do not conflict with laws in their state.

  Maryland imposes limits on hard coastal armoring through the ***Living Shoreline Protection Act***, passed in 2008. The Maryland Department of Environment (MDE), a state agency, has permitting authority over shoreline armoring. The Act codified a preference for nature-based flood control—or "living shorelines". Property owners who wish to construct hard armoring, such as bulkheads or sea walls, have to meet certain criteria and must show that living shorelines are not viable for their

property. Because armoring decisions will not primarily be made at the local level, the model ordinance does not focus on protection policies. However, the Act does present some opportunities to support local adaptation. MDE developed shoreline maps to assess the suitability of living shoreline approaches in different parts of the Maryland coast. The maps could be used by local governments to inform where non-structural, land-use adaptations will be an essential tool for mitigating flood impacts.

The ***Chesapeake and Coastal Bays Critical Areas Act (CAA)*** is Maryland's coastal management statute; it presents both opportunities and barriers to the policies proposed in the model. First, the Act requires the Critical Areas Commission and local governments to designate "development areas" (Intensely Developed Areas, Limited Development Areas, and Resource Conservation Areas) based upon the presence of natural resources and the state of development. Different development controls are triggered in each area. Maryland localities could use these designations to inform where they draw the boundaries for each SLR zone. Through these designations, policymakers have already determined the state of existing development and the natural resources present in the area—determinations that could be used to set adaptation goals for these areas. Second, the Act requires that waterfront properties preserve a 100-foot buffer, in its natural state, to protect water quality. These buffers will provide some natural protection from flood impacts. Where properties have sufficient buildable space, communities could require additional setbacks to protect the CAA buffer and allow space for the buffer to migrate inland as sea levels rise (e.g., require an additional 20 foot setback from the buffer). By adding a setback requirement, communities can ensure that structures will not come to encroach as the CAA buffer erodes or is inundated. The CAA also presents some problematic barriers to adaptation, however, particularly the retreat policies included in the Conservation Zone. The Act includes grandfathering provisions that require local governments to allow for the continuation of uses that pre-date the Act, unless the use is "abandoned". This may limit the ability of localities to restrict redevelopment of storm-damaged structures or downzone grandfathered structures in vulnerable areas.

Historic preservation requirements may also limit adaptation options in communities with many historic structures. Historic preservation is primarily administered at a local level in Maryland. Although there are state and federal laws that encourage historic preservation, these laws do not limit the alteration or demolition of private property. Instead, pursuant to state delegation, local governments can regulate historic properties through the creation of Historic Area Overlay Zones where a Historic Preservation Commission (HCP) is appointed to review and approve changes to historic properties. HCPs review changes based upon considerations of the structure's architectural significance and other aesthetic factors. It is unclear whether HCPs consider a structure's risk of flooding when approving exterior changes. Historic preservation requirements may conflict with or make it more expensive to elevate or retrofit historic structures to protect against flood damage. Additionally, rebuilding restrictions may not be feasible in historic districts because such policies will conflict with state and local goals to preserve these cultural resources.

- ***Consistency with constitutional laws***: The primary concern that most local governments have when enacting new regulations is that they will be sued for violating constitutional protections of property rights. Both the United States and Maryland constitutions prohibit regulatory actions that (i) "take" private property without just compensation ("takings") and (ii) are arbitrary or unreasonable (substantive due process).

  Takings law prohibits government regulations that "go too far"—regulations that effectively expropriate private property without the payment of just compensation. SLR regulations would likely be analyzed under one of two takings test: First, a regulation that deprives a property owner

of all economically beneficial use is a taking *per se*, and requires compensation unless the government can show that the use would have otherwise been prohibited at common law (e.g., as a public nuisance). Second, if a regulation does not constitute a *per se* taking, the court weighs three factors to determine whether the regulation goes too far: (i) the economic impact of the regulation, (ii) the character of the government action, and (iii) the reasonable investment-backed expectations of the landowner. Even though many of the issues raised by SLR regulations are novel and have not yet been specifically addressed by any court, local governments should not be overly circumspect in regulating to mitigate SLR impacts. While affected property owners often raise takings challenges to new regulations, these challenges are rarely successful. Maryland courts have upheld carefully tailored regulations that serve important public purposes, such as preventing public health impacts from septic, and where the regulation allows for some residual economic use of regulated lands. Additionally, laws that provide sufficient notice of regulatory changes and give property owners time to adjust their investment decisions based upon new regulatory restrictions have a much higher chance of overcoming a constitutional challenge.

Substantive due process requirements of the Constitution also prohibit irrational and unreasonable regulation. Thus, new SLR regulations must be "rationally related to a legitimate public purpose". By using existing flood zone designations, new SLR regulations are likely to survive a substantive due process challenge. FEMA mapping practices establish that these areas have a statistical risk of flooding based upon historic flood data. Additionally localities can use climate change vulnerability assessments to demonstrate that these areas will be subject to increasing impacts as sea levels rise over the next century, thus justifying enhanced regulation.

- ***Integration****:* Local governments must also ensure that each policy integrates with other ordinances that regulate land use. Land-use regulations are often imposed through several different laws: zoning ordinances, floodplain ordinances, building codes, among others. And, land-use regulations tend to differ significantly by jurisdiction. Because the model ordinance was developed by adapting regulatory provisions from codes developed by other jurisdictions, drafters using this model will need to ensure that the model language integrates with their existing codes and ordinances. For example, drafts will need to ensure that definitions are used consistently, that development standards in the SLR zones are consistent with (or more restrictive than) the standards required by other applicable zones, and that new regulations integrate with the general administrative provisions within their zoning ordinance.

Policy

In the testing phase, we also analyzed the policy considerations that local governments will need to weigh when determining whether they *should* implement a particular policy. There is no one-size-fits-all approach to adaptation because communities have widely different terrain, including different states of development, resources at risk (e.g., critical facilities, natural resources), potential for armoring, perception and sensitivities to risk, among other things. As a result, policies that may be politically untenable in one community may be well received in another. To help local governments assess which policies best fit their community, we provide a framework to help policymakers analyze the potential policy barriers to implementation:

- ***Costs/Benefits*****:** How much will it cost to implement a measure and what economic benefits will be achieved?
- ***Political*****:** Will a measure face political opposition?

- ***Administrative/Technical*:** Does the local government have sufficient technical and administrative capacity and training to implement a measure?

In Maryland, we compared the feasibility of implementing the model ordinance in two communities: Anne Arundel County and the City of Annapolis. The results demonstrate the need for a localized approach to adaptation. Densely developed, historic cities like Annapolis will have limited options to retreat from the coast and are more likely to use coastal armoring to protect development. Meanwhile, Ann Arundel County, with over 530 miles of less developed, more rural coastline, will face fewer physical barriers to retreat, but economic constraints and environmental concerns may limit the viability of hard protection. Maryland serves as an example to all coastal states—in order to develop an effective adaptation strategy, policymakers will have to consider the specific socio-economic, geographic, environmental and political characteristics of their communities.

4. Conclusion: Lessons Learned

From this project we learned that although local governments face many challenges in adapting to SLR, they also have a lot of options.

State laws will likely pose the biggest barrier to adaptation. State laws tend to vary significantly between states; each state applies a different model for regulating coastal lands. Regulations also tend to be highly "siloed" based upon the type of habitat or ecosystem (e.g., beaches, coastal wetlands, floodplains). Additionally, state statutes often include antiquated policies that could hinder or prohibit local adaptation efforts, such as grandfathering provisions that allow for the continuation of uses that existed before the statute was enacted. Therefore, in order to implement more precautionary land-use regulations, localities may need assistance analyzing state coastal laws to ensure that the policies they want to implement do not conflict with state law requirements. Legislatures may also need to amend state laws to give localities more flexibility to respond to climate change.

The good news is that communities will be able to overcome legal barriers in most cases. Local governments in many flood-prone communities have experimented and developed cutting-edge land-use policies to mitigate flood hazards. These policies can be borrowed and adapted in other jurisdictions to cope with SLR. Federal law will not prevent local adaptation efforts, but federal programs could be redesigned to better support local efforts and specifically address climate threats. Finally, although courts have yet to weigh in on the issue, it is likely that local governments can carefully craft land-use regulations to allow them to address the substantial public harms threatened by SLR while avoiding takings liability. In sum, communities have authority to enact adaptive land-use regulations and most regulatory approaches will not conflict with state, federal or constitutional laws. We hope the model SLR ordinance will provide an important tool to help communities tailor their regulatory responses to climate change to meet unique local needs.