COMMENTS

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Growing with Water Hazards in California: State and Local Leadership for Climate Adaptation in Comprehensive General Land-Use Plans

INTRODUCTION

Water-related natural disasters[1] result in the loss of life, loss of property, and severe damage to the environment.[2] In California, water resource administration is encumbered by temperamental hydrological conditions,[3] complex interbasin transfer agreements,[4] and over-appropriated watersheds.[5] This is magnified by the current and future effects of climate change, which are "expected to exacerbate current stresses on water resources from population growth and economic and land-use change, including urbanisation."[6] For example, climate projections forecast that the over-appropriated Colorado River,[7] which is a major source of water for cities, agriculture, and hydroelectricity generation in California, will experience up to a twenty percent reduction in annual flows by 2057.[8] Further, seasonal extremes in the Sierra Nevada Mountains have also intensified. There, winter storms and rapid warming temperatures resulted in disastrous spring flood events and prolonged summer

1 *Water-Related Disasters*, UNESCO, http://en.unesco.org/themes/water-security/hydrology/water-related-disasters (last visited Nov. 13, 2018); The United Nations Environment Programme estimates that water-related hazards account for over 90% of natural hazards, globally. UNEP, *What We Do: Addressing Water-Related Conflict and Disasters*, https://www.unenvironment.org/explore-topics/water/what-we-do/addressing-water-related-conflict-and-disasters (last visited Nov. 13, 2018).

2 Patricia E. Salkin, *Sustainability at the Edge: The Opportunity and Responsibility of Local Governments to Most Effectively Plan for Natural Disaster Mitigation*, 38 ENVTL. L. REP. NEWS & ANALYSIS 10158, 10158 (2008).

3 *See generally* JEFFREY F. MOUNT, CALIFORNIA RIVERS AND STREAMS: THE CONFLICT BETWEEN FLUVIAL PROCESS AND LAND USE 146–52 (1995) (describing complexities of California water management).

4 *See* Robert W. Adler, *Climate Change and the Hegemony of State Water Law*, 29 STAN. ENVTL. L.J. 1, 23–25 (2010).

5 Christine A. Klein, *Water Bankruptcy*, 97 MINN. L. REV. 560, 571 (2012).

6 IPCC, CLIMATE CHANGE 2007: SYNTHESIS REPORT 49 (2007), https://www.ipcc.ch/site/assets/uploads/2018/02/ar4_syr_full_report.pdf.

7 *See* Adler, *supra* note 4, at 14–15.

8 Balaji Rajagopalan et al., *Water Supply Risk on the Colorado River: Can Management Mitigate?*, 45 WATER RESOURCES RES. 1, 1 (2009).

droughts for receiving waters, such as the San Joaquin River.[9] These instances are a glance of hydrological sensitivity to climate change, which has led water research experts to conclude that "climate change is water change."[10]

The challenge of concurrently planning for water shortages, flooding, and sea level rise paired with increased supply pressure from population growth cannot be understated. And, certainly, the task is further complicated given the Trump administration's and Congress's absence of federal leadership on climate change.[11] Many experts recognize that planning with this level of uncertainty[12] in the era of climate change will be one of the most significant challenges to water resource management this century.[13] Despite this uncertainty, the legal regimes and institutions governing water resources and flood management must respond in ways that are to address the range of inevitable impacts, beyond the "wait-and-see approach."[14] Indeed, local governments have demonstrated leadership through the adoption of binding and nonbinding climate plans, despite ambiguity and the tenuous position of the federal government on climate change. Thus, the goal of this Article is to advance climate planning literature by answering the following question:

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9 *See* John T. Andrew et al., *California Water Management: Subject to Change*, 14 HASTINGS W. NW. J. ENVTL. L. & POL'Y 1463, 1464–66 (2008); Joseph Serna, *Rivers Swollen from Melting Sierra Nevada Snowpack Claim Another Life in the Central Valley*, L.A. TIMES (May 22, 2017, 9:40 A.M.), http://www.latimes.com/local/lanow/la-me-ln-central-valley-drowning-river-snowpack-20170522-story.html.

10 Chelsea Harvey, *Climate Change is Water Change—Why the Colorado River System Is Headed for Major Trouble*, WASH. POST: ENERGY & ENV'T (Aug. 19, 2016), https://www.washingtonpost.com/news/energy-environment/wp/2016/08/19/climate-change-is-water-change-why-the-colorado-river-system-is-headed-for-trouble/?noredirect=on&utm_term=.5d8881e17cc1 (quoting Brad Udall, senior water and climate research scientist at Colorado Water Institute of Colorado State University).

11 *See generally* Vicki Arroyo, *State and Local Climate Leadership in the Trumpocene*, 4 CARBON & CLIMATE L. REV. 303 (2017).

12 "[A]lthough the exact nature and magnitude of changes in global water resources remains uncertain, there is a growing scientific consensus that those changes will be real and significant." Adler, *supra* note 4, at 10.

13 Michelle Bryan Mudd, *A Next, Big Step for the West: Using Model Legislation to Create a Water-Climate Element in Local Comprehensive Plans*, 3 WASH. J. ENVTL. L. & POL'Y 1, 17–18 (2013); Andrew et al., *supra* note 9, at 1463; Thomas M. Gremillion, *Setting the Foundation: Climate Change Adaptation at the Local Level*, 41 ENVTL. L. 1221, 1226–27 (2011).

14 Adler, *supra* note 4, at 9–10.

> Based on the assumption that clear legal objectives improve policy implementation,[15] can cities overcome the obstacles of climate uncertainty and legal fragmentation[16] in water resource adaptation planning by integrating local climate action plans into municipal general plans?

This Article considers federal, state, and local climate-planning tools in the context of water resource adaptation in California and presents research on local climate action plans that identify two potential strategies for local governments to continue their demonstrated leadership in climate planning. Part I distinguishes climate mitigation and adaptation policies and discusses the need to move climate adaptation beyond a nominal role in climate planning. Part II provides a brief overview of the current water and climate regulatory regime at federal and state levels that affect water management in California. Finally, Part III distinguishes climate mitigation and adaptation policies and presents the methodological approach and results for an adaptation-embeddedness[17] analysis of sixty-nine municipal climate action plans from California cities. Part III also proposes the solution of including the climate action plan as an element in California municipal general plans and addresses the obstacles and benefits that arise from comprehensively planning for water resources, hazards, and climate change in this manner.

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15 Paul A. Sabatier, *Top-Down and Bottom-Up Approaches to Implementation Research: A Critical Analysis and Suggested Synthesis*, 6 J. PUB. POL'Y 21, 23, 28–29 (1986).

16 According to Professor Mudd, legal fragmentation is prevalent in water resources and land use planning since water quality, quantity, and land use planning authority is dispersed across federal, state, and local actors, respectively. Mudd, *supra* note 13, at 7. An example of legal fragmentation in water resources adaptation planning is the Natural Hazard Vulnerability Assessments under the Disaster Management Act, 42 U.S.C. § 5165 (2000), which requires state, local, or tribal governments to submit a hazard mitigation plan "that outlines processes for identifying the natural hazards, risks, and vulnerabilities of the area under the jurisdiction of the government." § 5165(a). However, these plans are rarely used by decision-making bodies in a land use planning or water management context, which are both run by separate local, regional, or state governing bodies. Mudd, *supra* note 13, at 24–30. Sharing information and cross-agency communication is of tantamount importance for the regulation of water, let alone developing climate adaptation measures for water quality, quantity, and hazards. *Id.*

17 Adaptation-embeddedness is defined in this Article as the extent that the city accounted for the flooding, quality, quantity, and land use elements in planning to adapt to the impacts of climate change to water resources. For a general definition of embeddedness of adaptation to climate change *see* Frans Berkhout, *Adaptation to Climate Change by Organizations*, 3 WILEY INTERDISC. REV.: CLIMATE CHANGE 91, 92 (2012).

I
BEYOND THE MITIGATION FRAMEWORK: RISING CHALLENGES AND THE CALL FOR CLIMATE ADAPTATION PLANNING

Generally, climate change policy falls within two somewhat distinct planning approaches: mitigation and adaptation. The mitigation approach is rationalized through decades of climate science that links human activity to increased levels of heat-trapping greenhouse gases in the atmosphere.[18] Climate scientists have connected the increased concentration of greenhouse gases to the rise in global temperatures, which significantly impacts human health, safety, and welfare.[19] Like all other sectors, planning for climate change mitigation in the water management context focuses on emissions reduction and atmospheric stabilization to reduce the catastrophic costs of climate change.[20] Similarly, adaptation seeks to reduce the societal costs of climate change but without an exclusive focus on emissions reduction.[21] Here, adaptation includes a wide range of strategies to prepare communities by adjusting use and consumption behaviors or by improving infrastructure to absorb and adapt to water-related hazards.[22] To be clear, mitigation and adaptation strategies are not mutually exclusive; often, strategies are designed to yield cobenefits from implementation.[23] For example, a reduction in domestic water use

18 Mostly connected through the extraction, use, and reliance of fossil fuels. U.S. GLOBAL CHANGE RESEARCH PROGRAM, GLOBAL CLIMATE CHANGE IMPACTS IN THE UNITED STATES 13 (2009), https://downloads.globalchange.gov/usimpacts/pdfs/Global.pdf [hereinafter *Global Impacts*]; *see* Roger A. Pielke, *Rethinking the Role of Adaptation in Climate Policy*, 8 GLOBAL ENVTL. CHANGE 159, 161–62 (1998).

19 *Global Impacts*, *supra* note 18, at 13; *Climate Impacts on Human Health*, U.S. ENVTL. PROTECTION AGENCY, https://19january2017snapshot.epa.gov/climate-impacts/climate-impacts-human-health.html (last visited Nov. 27, 2018).

20 Pielke, *supra* note 18, at 162–63.

21 European Commission, *Adaptation to Climate Change*, EU: CLIMATE ACTION, https://ec.europa.eu/clima/policies/adaptation_en (last visited Nov. 16, 2018) (climate "[a]daptation means anticipating the adverse effects of climate change and taking appropriate action to prevent or minimise the damage they can cause, or taking advantage of opportunities that may arise. It has been shown that well planned, early adaptation action saves money and lives later."); Gremillion, *supra* note 13, at 1227–28.

22 Adler, *supra* note 4, at 8–10.

23 *See* United Nations Framework Convention on Climate Change art. 3 ¶ 3, May 9, 1992, S. Treaty Doc. No. 102-38, 1771 U.N.T.S. 107 [hereinafter UNFCCC] (addressing the need to cooperatively manage for climate mitigation and adaptation). Note, too, that the opposite is true: adaptation and mitigation measures can exacerbate the ills of climate change if not cooperatively managed. For example, coastal desalination plants require an

lowers emissions from water conveyance infrastructure by requiring *less* energy for *fewer* water deliveries, and it is a long-term response to water resource shortages by reducing demand for consumption.[24]

Despite the need to address mitigation and adaptation in tandem[25] and the call by experts to respond to climate change disturbances that have "push[ed] the hydroclimate beyond the range of historic trends, and beyond the ability of existing water resources infrastructure to cope,"[26] adaptation continues to only receive an "honorable mention" in most climate policy documents. This approach is often due to complex legal expertise and spatial fragmentation issues that arise from the cooperative management of water resources for adaptation.[27] Thus, a major challenge for climate policy is to enhance governing strategies that comprehensively address adaptation, from risks of natural hazards to impacts in water quality.[28]

II
FEDERAL AND STATE WATER RESOURCE MANAGEMENT: A COOPERATIVE GOVERNANCE FRAMEWORK

This Article argues that there are immediate, low-cost opportunities for water resources adaptation that can be realized by municipal integration of nonregulatory climate action plans within compulsory general plans. To reach this conclusion, a critical look at existing federal and state water resources management is necessary. Water resources management is a fragmented enterprise, since "water quality regulation is largely federal, water quantity regulation is largely state, and land use planning is largely local."[29] A closer look reveals that legal

energy-intensive process to generate clean water, which may result in increased emissions to secure a drinkable water supply. HEATHER COOLEY & MATTHEW HEBERGER, KEY ISSUES FOR SEAWATER DESALINATION IN CALIFORNIA: ENERGY AND GREENHOUSE EMISSIONS 4–5 (2013), http://pacinst.org/wp-content/uploads/2013/05/desal-energy-ghg-full-report.pdf.

24 *See, e.g.*, CITY OF COLTON, CLIMATE ACTION PLAN 4-21 to -22 (2015) (identifying strategies for water consumption reductions as a way to reduce electricity use and resulting emissions from water conveyance infrastructure).

25 UNFCCC, *supra* note 23.

26 Adler, *supra* note 4, at 9.

27 Mudd, *supra* note 13, at 7–8.

28 *See* Chris Koski & Alma Siulagi, *Environmental Harm or Natural Hazard? Problem Identification and Adaptation in U.S. Municipal Climate Action Plans*, 33 REV. POL'Y RES. 270, 273 (2016).

29 Mudd, *supra* note 13, at 7; Craig Anthony Arnold, *Introduction: Integrating Water Controls and Land Use Controls: New Ideas and Old Obstacles*, *in* WET GROWTH: SHOULD WATER LAW CONTROL LAND USE? 1, 34 (Craig Anthony Arnold ed., 2005).

fragmentation is also present within the federal level, since federal water statutes generally focus on a single subject, that is, *either* flood management *or* water quality management. This legal fragmentation results in little regulatory overlap between these subjects and complicates planning for water as a connected, integrated resource.

Section A examines several federal statutes and state regulations that impact flood disaster management, water quality, and water quantity planning. Section A.1 focuses on federal disaster mitigation planning mandates that require state and local governments to mitigate potential hazards through the Disaster Mitigation Act (DMA) of 2000. The DMA is the major federal program that requires state, tribal, and local governments to coordinate and identify natural hazard mitigation measures but fails to require state and local governments to implement legally binding natural hazard mitigation measures. Next, Section A.2 addresses the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program's 100-year floodplain provision and the grant of federal subsidies to developments and redevelopments within the floodplain. Then, in Section A.3 federal statutes affecting water quality regulation are discussed. The takeaway from this inquiry is the need for a resolution for federal fragmentation and a more integrative federal role of water law and policy. Finally, Section B discusses the state's role in managing water quantity and examines the artificial distinction between water quantity and water quality management.

A. Federal Flood and Water Quality Management

1. Compulsory Hazard Mitigation Planning Under the Disaster Management Act: Why Financial Incentives "To Plan" Fall Short of Implementation

The DMA is the regulatory catalyst for hazard mitigation[30] planning at the federal level. The goal of the DMA is to establish "a [national] program for predisaster mitigation, [and] to streamline the administration of disaster relief[.]"[31] This is accomplished by a combination of "carrots" (federal financial support for disaster relief)

30 "Hazard mitigation" is defined as "sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards." 44 C.F.R. § 201.2 (2015).

31 Disaster Mitigation Act of 2000, Pub. L. No. 106-390, 114 Stat. 1552 (2000) (codified as amended at 42 U.S.C. §§ 5121–5208).

and "sticks" (restrictions on eligibility for certain funding streams).[32] In action, § 322 of the DMA requires state governments to develop mitigation plans that meet DMA criteria standards to be eligible for financing post-disaster projects under FEMA's Hazard Mitigation Grant Program (HMGP).[33] Similarly, local governments are required to participate in state plans to receive hazard mitigation project funding for infrastructural improvements.[34]

The state mitigation plan is the primary implementation strategy for achieving a nationally coordinated natural disaster plan. There are five elements to every state mitigation plan:

(1) Documentation and description of the planning process;[35]
(2) A hazard risk assessment;
(3) Mitigation strategies for reducing current and future risks;
(4) A plan maintenance and implementation methodology (to be reviewed every five years); and
(5) A coordination strategy to involve state and local agencies, community stakeholders, and the public[36] in the planning process.[37]

Using these minimum criteria, states develop a mitigation strategy that provides a "blueprint for reducing the losses identified in the risk assessment,"[38] a list of state goals, and mitigation action items that the state is considering.

State mitigation plans are broken down further into two tiers of plans: (1) the standard mitigation plan and (2) the enhanced state mitigation plan. The standard state mitigation plan requires states to address each of the five planning elements, listed above, to be eligible for post-disaster relief funding up to 7.5% of the total eligible disaster assistance funds available per fiscal year.[39] By contrast, the enhanced state mitigation plan expands these requirements by instructing the state to, among other things, demonstrate "that the plan is integrated to

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32 Anna K. Schwab & David J. Brower, *Increasing Resilience to Natural Hazards: Obstacles and Opportunities for Local Governments Under the Disaster Mitigation Act of 2000*, 38 ENVTL. L. REP. NEWS & ANALYSIS, 10171, 10181 (2008).

33 *Id.*

34 *Id.*

35 FED. EMERGENCY MGMT. AGENCY, MULTI-HAZARD MITIGATION PLANNING GUIDANCE UNDER THE DISASTER MITIGATION ACT OF 2000 (2008).

36 44 C.F.R. § 201.4(b) (2017).

37 Salkin, *supra* note 2, at 10161.

38 44 C.F.R. § 201.4(c)(3).

39 Salkin, *supra* note 2, at 10160–61.

the extent practicable with other State and/or regional planning initiatives ([i.e.] comprehensive, growth management, economic development, capital improvement, land development, and/or emergency plans). . . ."[40] Fulfilling the expanded criteria of the enhanced state mitigation plan allows the state to be eligible for up to 20% of disaster assistance funds available, thus incentivizing state proactivity in pre-event hazard mitigation via risk integration into planning policy.[41]

Although the DMA outlines a comprehensive approach for assessing hazard risk and crafting a localized mitigation plan, a major criticism of the DMA is that it fails to compel states to *actually implement* mitigation actions.[42] This is exemplified by the statutory construction of the DMA, which prompts local governments to produce a mitigation plan for submission and approval by the state and FEMA regional offices to be eligible for federal disaster assistance and HMGP funds but does not require local governments to do anything more than describe and list their proposed implementation methodology.[43] Nowhere in the DMA is there a mandate for local governments to pursue and apply implementation actions for natural disaster mitigation. Thus, implementing enforceable disaster mitigation planning regulations remains an entirely voluntary function of local governments.

Another shortcoming of the DMA is that it is largely aimed at federal emergency management, rather than local planning.[44] In practice, a large number of local plans submitted to FEMA under the DMA are simply "glorified emergency operation plans."[45] Generally, these emergency operation plans address a community's emergency preparedness, response, and recovery, rather than pre-event disaster mitigation actions that limit exposure of people and property to disaster risks.[46] The almost exclusive focus on emergency management overshadows a planning approach that integrates water resources, land use management, and development pattern strategies. Local planners

40 44 C.F.R. § 201.5(b)(1) (2017).

41 Salkin, *supra* note 2, at 10161.

42 Schwab & Brower, *supra* note 32, at 10182.

43 *Id.* at 10182–83.

44 *Id.* at 10184.

45 *Id.*

46 *Id.*

have indispensable insight to formulate mitigation strategies that reduce local vulnerability by regulating land uses and regulating future growth, which are often recognized by other federal programs.[47] But by concentrating on emergency preparedness alone, the DMA misses the opportunity to require local land-use and development policy to target disaster mitigation through local regulatory enforcement tools.

2. From the "Big Dam" Era of Federal Flood Control to Risk Management and the Grant to Gamble

In the past two hundred years, U.S. flood control policies have matured through several governance iterations.[48] In the nineteenth century, state and local governments were primarily responsible for living up to the societal expectation that government would provide "maximum protection" from floods. Early flood adaptation approaches of siting structures on "higher ground" was followed until the mid-nineteenth century, after a period of rapid population growth that forced residents to develop structures within flood-prone areas.[49] At that time, state and local governments began investing in hard structural defenses to flooding, such as dams and levees, to protect communities from disastrous flood events.[50] By 1936, the federal government usurped flood control from local and state government through a series of flood control legislation.[51] The Flood Control Act of 1936 (1936 Act) authorized the U.S. Army Corps of Engineers (USACOE) to erect engineered structures for flood solutions to improve waterways[52] and favored a shift from structural defense systems to the building of dams for floodwater retention.[53] It is estimated that the USACOE currently

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47 FED. EMERGENCY MGMT. AGENCY, INTEGRATING HAZARD MITIGATION INTO LOCAL PLANNING: CASE STUDIES AND TOOLS FOR COMMUNITY OFFICIALS 1-1, 1-2 (2013), https://www.fema.gov/media-library-data/20130726-1908-25045-0016/integrating_hazmit.pdf.

48 *See* Debbie M. Chizewer & A. Dan Tarlock, *New Challenges for Urban Areas Facing Flood Risks*, 40 FORDHAM URB. L.J. 1739, 1741 (2013).

49 A. Dan Tarlock, *United States Flood Control Policy: The Incomplete Transition from the Illusion of Total Protection to Risk Management*, 23 DUKE ENVTL. L. & POL'Y F. 151, 156 (2012).

50 Jacob Park & Christopher Brooks, *Local Flood Resiliency in an Era of Global Climate Change: Understanding the Multi-Sectoral Policy Dimensions*, 17 VT. J. ENVTL. L. 160, 165 (2015).

51 *Id.*

52 Flood Control Act of 1936, ch. 688, 49 Stat. 1570 (codified as amended at 33 U.S.C. §§ 701–709c (2017)).

53 Park & Brooks, *supra* note 50, at 166.

operates more than six hundred flood control dams across the nation.[54] Under the 1936 Act, structural engineering projects require the USACOE to complete watershed studies for the impact of building structural projects but fails to require the agency to consider the projects' potential impacts to the broader watershed.[55] This paradox highlights the primary concern of the 1936 Act, which is to site and design "discrete projects based on careful cost-benefit analysis, rather than on broad based and integrated planning for an entire basin."[56] Although the USACOE has shifted away from the emphasis on hard structural defenses and retention systems, federal funding issues and aging infrastructure continue to present significant obstacles to its flood control management efforts.[57]

Recognizing that structural flood control was a costly and insufficient enterprise, in 1968 Congress adopted the National Flood Insurance Program (NFIP).[58] The NFIP offered federally subsidized flood insurance to residents in municipalities that have adopted land-use controls, which limit development in floodplains[59] and flood-prone areas.[60] Today, the NFIP drives the design and implementation of floodplain regulation in general plans. In California, where decades of active urban sprawl resulted in the urbanization of floodplains and flood-prone areas, the NFIP directs local communities to develop and apply measures that prohibit development in the 100-year floodplain and requires owners of nonconforming structures to purchase federal

54 *Id.* (citing NAT'L RES. COUNCIL, NATIONAL WATER RESOURCES CHALLENGES FACING THE U.S. ARMY CORPS OF ENGINEERS 8 (2011)).

55 *Id.* at 166–67.

56 *Id.* at 167.

57 A. Dan Tarlock & Deborah M. Chizewer, *Living with Water in a Climate-Changed World: Will Federal Flood Policy Sink or Swim?* 46 ENVTL. L. 491, 503 (2016).

58 42 U.S.C.A. §§ 4001–33 (West 2012).

59 *See* Dep't of Reg'l Dev. & Env't Exec. Secretariat for Econ. & Soc. Affairs Org. of Am. States, *Primer on Natural Hazard Management in Integrated Regional Development Plan*, pt. III, ch. 8, sec. A, sec. 1 (1991), http://fnad.org/Documentos/Primer%20on%20Natural%20Hazard%20Management%20in%20Integrated%20Regional%20Development%20Planning.pdf (last updated Sept. 14, 2013) ("Floodplains are, in general, those lands most subject to recurring floods, situated adjacent to rivers and streams. Floodplains are therefore 'flood-prone' and are hazardous to development activities if the vulnerability of those activities exceeds an acceptable level.").

60 Tarlock & Chizewer, *supra* note 57, at 505–06.

flood insurance.[61] This program results in disaster avoidance, which reduces long-term repair or redevelopment costs associated with "disastrous" flood events through regulatory and market incentives.[62] But, according to many experts, the program "was flawed from the start, and its problems have progressively worsened."[63]

First, the program is backlogged in the production of accurate, updated Flood Insurance Rate Maps (flood maps).[64] Flood maps are integral to effective floodplain management since they determine whether property owners are situated near or within the 100-year floodplain[65] and thus, whether they require flood insurance. The maps consist of topographical and property ownership (tax lots) surveys and include factors such as slope, precipitation, hydraulic, and fluvial geomorphic analysis to the floodplain and its interaction with surrounding properties.[66] Second, the accuracy of old flood maps and new,[67] more technologically advanced ones are routinely challenged by local government agencies, which results in denials of flood map amendment proposals.[68] Finally, serious questions arise regarding the usefulness of the maps, many of which do not consider the impacts of climate change, such as sea levels or changes in precipitation events.[69]

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61 MOUNT, *supra* note 3, at 268–69; *see also* Local Flood Protection Act, CAL. WATER CODE §§ 8200–8201 (West 2009) (providing the voluntary procedure and provisions for a local government agency to prepare a local plan of flood protection).

62 MOUNT, *supra* note 3, at 268–69.

63 A. Dan Tarlock, *United States Flood Control Policy: The Incomplete Transition from the Illusion of Total Protection to Risk Management*, 23 DUKE ENVTL. L. & POL'Y F. 151, 168 (2012).

64 NAT'L RESEARCH COUNCIL OF THE NAT'L ACADS., TYING FLOOD INSURANCE TO FLOOD RISK FOR LOW-LYING STRUCTURES IN THE FLOODPLAIN 17 (2015).

65 "In written testimony to Congress, FEMA administrator Craig Fugate indicated that the 'in or out' nature of [flood maps] creates a credibility problem." Tarlock & Chizewer, *supra* note 57, at 506 n.87 (citing *Examining the Reauthorization of the National Flood Insurance Program Hearing Before the S. Comm. on Banking, Hous., and Urban Affairs*, 112 Cong. 43 (2011)).

66 U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-14-29-297R, OVERVIEW OF GAO'S PAST WORK ON THE NATIONAL FLOOD INSURANCE PROGRAM 28, 30 (2014), https://www.gao.gov/assets/670/662438.pdf.

67 "New" technologies include 3-D mapping data from Light Detection and Ranging (LIDAR) instruments. Tarlock & Chizewer, *supra* note 57, at 507. These technical improvements are limited by the cost of running the mapping instruments but improve mapping accuracy where used. *Id.* at 507–08.

68 *See id.* at 508 (stating that "complaints continue to emerge regarding the accuracy of the *new* maps with 89% of the 30,000 flood map amendment requests proving successful").

69 GAO-14-29-297R, *supra* note 66.

But what is the 100-year floodplain, and why does this "line in the sand"[70] influence billions of dollars of development and infrastructure investments? The 10-year, 50-year, and 100-year flood concepts are based on the statistical estimation of the probability that instream conditions will equal or exceed the average daily discharge in a given year either in peak flow conditions or by volume of flow over several days. This concept is referred to as the exceedance probability (*P*) and is used to calculate the recurrence interval (*T*)[71] of a flow condition.[72] For the 100-year flood, there is a 0.01 exceedance probability or 100% ($P = 1/0.01$) recurrence interval for the 100-year flood in any one hundred year period, based on the probability of that volume of discharge for a given waterway. This probability does not mean that the 100-year flood will punctually occur every one hundred years. Rather, the recurrence interval concludes that the 100-year flood volume will occur every one hundred years with a 1% probability of occurring *every* year. Simply put, over the course of ten thousand years, the one hundred year volume of discharge (one hundred year recurrence interval) will occur one hundred times in any watercourse. Notwithstanding the fact that these one hundred year flows could be evenly distributed across ten thousand years or all occur within the first one hundred years, the exceedance probability and recurrence interval stay the same.

As explained above, the recurrence interval is not really a *predictor* of the interval between flow volumes but a way to express the likelihood that a flow volume will occur over a period of time. Viewed alone, the recurrence interval perpetuates the myth that the 100-year flood will likely occur within the next one hundred years, but that it is not a certainty. This myth preserves a false sense of sound reasoning: since there is low probability (1%) that a 100-year flood will occur in any year, it is economically feasible for public and private developers to pursue projects within or abutting the 100-year floodplain because the cost to avoid the flood risk is low.[73] However, this approach fails to

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70 MOUNT, *supra* note 3, at 269.

71 The recurrence interval is expressed as $1/P$ or *T*. RO CHARLTON, FUNDAMENTALS OF FLUVIAL GEOMORPHOLOGY 31 (2008).

72 *Id.* at 31–32.

73 In analyzing the risk of flood to a specific location, other characteristics are considered such as "flood zone designation, elevation of the property relative to the community's base flood elevation . . . , building type, number of floors, presence of a basement, and the year a

include an accumulation of probability over a number of years that the 100-year flood will occur. That is, over a longer period of time, every year that the 100-year flow volume does not occur, the likelihood that it will occur next year *increases*. The accumulation of probability is expressed by the calculation:

$$P = 1 - [1 - 1/T]^{n}.$$[74]

Consider this simple example: a buyer purchases residential property in the 100-year floodplain and lives there for twenty years; the probability that the property will be flooded in any one year is 1% (0.01 = *P*). This increases to a 20% probability (0.01 × 20 years) for the twenty-year period. Thus, there is a one-in-five chance that the property located in the 100-year floodplain will flood during the course of ownership. These odds, when viewed as an accumulation of risk, still may be favorable enough for some owners to develop property in the 100-year flood plain. And when coupled with the NFIP's flood insurance plans, the risk of loss to owners is further mitigated by the program's provision of federal subsidies for development and redevelopment after disastrous floods in floodplains.

Behind the statistical application of flood frequency there is the changing and evolving river itself. Data on instream flow and flow frequencies (e.g., collected by U.S. Geological Survey stage recorders) are used to estimate peak discharge of the 100-year flood event and can be expressed as a frequency curve.[75] The frequency curve reflects the distribution of discharge values fitted to the discharge volume's exceedance probability.[76] Researchers in California have found that an exceptionally large discharge volume impacts the frequency curve by increasing the slope of the curve, which in turn results in a greater discharge estimate for the 100-year event.[77] Following this data, researchers concluded that greater discharge estimates for the 100-year flood lead to an expansion of the 100-year floodplain.

The inverse of the scenario can also occur. Where smaller (over a greater period of time) annual peak discharges are recorded and plotted on the frequency curve, the slope of the curve can decrease, thereby

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structure was built relative to the year of a community's original flood map." GAO-14-29-297R, *supra* note 66, at 16.

74 Where *n* is the number of years. MOUNT, *supra* note 3, at 273.

75 *Id.* at 275–79; RO CHARLTON, *supra* note 71, at 32–34.

76 RO CHARLTON, *supra* note 71, at 32–34.

77 MOUNT, *supra* note 3, at 278–79.

decreasing the area of the plotted watercourse's floodplain.[78] The frequency curve is one method of data analysis used to calculate floodplain boundaries and is exampled here to demonstrate the "fluid nature of the line in the sand"[79] of defining the 100-year floodplain, even at the analytical level of data collection and synthesis. Hydrologists continue to refine these methods but are ultimately at the behest of the administrative review process of local governments who ultimately adopt the hard boundary of each level of floodplain.

Many hydrologists bemoan the fact that the 100-year floodplain is an arbitrary measurement that creates a false sense of security in land-use planning decisions.[80] Professor Jeffery Mount argues that the implicit conclusion that those homes located ten feet inside the 100-year floodplain are safer than those located ten feet outside the designation is scientifically untenable—though perhaps politically defensible.[81] This is because flood magnitudes form a continuum of hydrographic conditions with no "natural break at the 100-year flood mark."[82] Yet political and administrative feasibility of programming such a "hard line" into flood and disaster management continues to make the option of adopting the 100-year floodplain standard an attractive policy. FEMA, the Army Corps of Engineers, and state disaster management agencies continue to rely on the 100-year flood concepts explained above to manage and reduce risks of flooding, even when there is virtually no certainty that the 100-year floodplain defined by these concepts is accurately defined.[83]

3. Federal Water Quality Standards

There is no doubt that federal water quality regulations are effective in driving water resources management and land-use planning decisions.[84] However, questions remain regarding the extent of state authority in managing instream flow requirements and water diversions

78 *See id.* at 277–78 (acknowledging that smaller peak discharges can influence a watercourse's frequency curve but do not have the same effectiveness in shifting the curve as a large flooding event).

79 *Id.* at 277.

80 *Id.*

81 *Id.*

82 *Id.*

83 *Id.* at 281.

84 Arnold, *supra* note 29, at 15–16.

under state water law when such authority conflicts with federal standards. Here, two federal statutes, the Clean Water Act (CWA) and the Endangered Species Act (ESA) are analyzed, in turn.

First, the EPA is responsible for administering and enforcing state compliance with federal mandates for surface water quality standards under the CWA.[85] Under the CWA, the EPA establishes minimum treatment standards for some types of pollution.[86] Then, under a cooperative federalism structure, states are granted the authority to "establish goals for ambient water quality, implement the [CWA's] permitting programs, develop . . . comprehensive planning and nonpoint source pollution programs, and certify whether federally licensed or permitted projects will comply with state requirements."[87]

While the cooperative federalism model has, historically, resulted in Congress's deference to state water law in the CWA,[88] it is less certain which law controls when the two legal regimes conflict. When confronted with this issue, the Supreme Court found that there is an "artificial distinction" between water quality and water quantity and upheld the state water law's authority to manage instream flow standards for federally licensed projects under section 401 of the CWA.[89] Scholars have also noted that it is unclear how the law will respond to the opposite scenario, where changes in permitting or hydrological conditions increase water distributions under state law in a manner that affects compliance with or attainment of the CWA and its goals.[90]

This uncertainty will likely become more prevalent as climate change impacts hydrological regimes. The uncertainty is particularly prevalent in California, where water scarcity is driving state water managers to secure new water resources, and users seek to enforce water allocation rights. For example, enforcing deliveries on depleting streams may result in issues of compliance with the CWA or may

85 Clean Water Act of 1977, 33 U.S.C.A. §§ 1251–1387 (West 2017).

86 33 U.S.C.A. §§ 1311(b)–(c), 1314(b) (West 2018).

87 Adler, *supra* note 4, at 27 (citing CWA's statutes that oversee cooperative federalism with state water quality standards 33 U.S.C. §§ 1288, 1313(c), 1319, 1341, 1342(b), 1344(g)–(l)).

88 §§ 1251(e), (g) (acknowledging the primary responsibilities and rights of states in managing water resources).

89 PUD No. 1 v. Wash. Dep't of Ecology, 511 U.S. 700, 719 (1994).

90 Adler, *supra* note 4, at 27–28. *See generally* Reed D. Benson, *Pollution Without Solution: Flow Impairment Problems Under the Clean Water Act Section 303*, 24 STAN. ENVTL. L.J. 199 (2005).

impact sensitive species that inhabit the aquatic environment. In this light, water quality is not exclusively managed under the CWA but also implicates the ESA, where protected species are present in aquatic environments facing critical environmental challenges.

The ESA is referred to by many scholars as the "federal land use planning tool," which imposes restrictions upon land use and development where, in the case of water, endangered aquatic or aquatic-dependent species are present in a given location.[91] In addition, the authority of the statute over state water law appears to be growing, as captured in the 2013 decision of the U.S. District Court for the Southern District of Texas,[92] which announced that "the [Act] preempts state water law and the exercise of state water rights."[93] Similarly, in the 2007 *National Resource Defense Council v. Kempthorne* decision, the Eastern District of California found that in promulgating a biological opinion on the impact of water pumping on the "threatened" listed Delta Smelt fish species, the U.S. Fish and Wildlife Service had not used the best available science since it failed to include the impacts of climate change to the Sacramento–San Joaquin River Delta (Bay Delta).[94] The decision drove the California Department of Water Resources to reconsider water deliveries for the U.S. Bureau of Reclamation's Central Valley Project and California's State Water Project in the Bay Delta and to announce that it would reduce pumping operations to abate jeopardizing the threatened species.[95] The recipients of water deliveries from the Bay Delta were farmers who since 2007 had coped with drought and water rationing by altering the agricultural use of their farmland and making investments in water-efficient irrigation systems. The shortages spurred by the decision in *Kempthorne* have "helped to force water rationing throughout California"[96] and consequently impacted the use and development of land by severely limiting water availability under the ESA. However, primarily relying on litigation to manage water resources and

91 Endangered Species Act (ESA) of 1973, 16 U.S.C. §§ 1531–1544 (2018); Arnold, *supra* note 29 at 37–38.

92 Ark. Project v. Shaw, 930 F. Supp. 2d 716 (S.D. Tex. 2013).

93 Robin Kundis Craig, *Does the Endangered Species Act Preempt State Water Law?*, 62 KAN. L. REV. 851, 851 (2014).

94 Nat'l Res. Def. Council v. Kempthorne, 506 F. Supp. 2d 322, 388 (E.D. Cal. 2007).

95 ROBIN KUNDIS CRAIG, ENVIRONMENTAL LAW IN CONTEXT: CASES AND MATERIALS 414 (3d ed. 2012).

96 Craig, *supra* note 93, at 869.

environmental quality is largely a reactionary technique, and litigation often fails to provide a prophylactic approach to adaptation and preparedness that can be achieved through climate adaptation planning.[97]

While it is important to continue the effort in enforcing federal statutes that give weight to responsible natural resource conservation, it is ultimately a misplaced hope that federal actions alone can accomplish the dual goals of local land use planning: economic development and environmental health. It is clear that, under the Trump administration, climate adaptation planning, from emergency management to environmental quality, is left to the states and local communities.[98] While financial and political resources are still available in some capacity from federal programming, cities must be proactive in securing such resources.[99] Thus, it is within the interest of state and local governments to cooperatively progress.

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97 However, there has been significant development in atmospheric trust litigation to use the judicial system as a prophylactic conduit for climate planning. *See* Mary Christina Wood & Charles W. Woodward, IV, *Atmospheric Trust Litigation and the Constitutional Right to a Healthy Climate System: Judicial Recognition at Last*, 6 WASH. J. ENVTL. L. & POL'Y 633, 669–73 (explaining the procedural history and holding of *Foster v. Washington Dep't of Ecology*, which required the State of Washington to develop administrative policy for carbon abatement under the public trust doctrine). However, the problem of justiciability for future injuries incurred by climate change (e.g., sea-level rise and extreme weather events) remains to be a significant challenge in climate change litigation. UNITED NATIONS ENVIRONMENTAL PROGRAMME, THE STATUS OF CLIMATE CHANGE LITIGATION: A GLOBAL REVIEW 28 (2017), http://wedocs.unep.org/bitstream/handle/20.500.11822/20767/climate-change-litigation.pdf?sequence=1&isAllowed=y (discussing justiciability challenges to standing for climate change litigation such that "it may be difficult for an individual plaintiff to establish an adequate causal connection between a defendant's allegedly unlawful actions or inaction and an injury that is linked to climate change impacts").

98 Eric Lipton & Hiroko Tabuchi, *Driven by Trump Policy Changes, Fracking Booms on Public Lands*, N.Y. TIMES (Oct. 27, 2018), https://www.nytimes.com/2018/10/27/climate/trump-fracking-drilling-oil-gas.html; Lisa Friedman, *Trump Administration Formally Rolls Back Rule Aimed at Limiting Methane Pollution*, N.Y. TIMES (Sept. 18, 2018), https://www.nytimes.com/2018/09/18/climate/trump-methane-rollback.html; Brady Dennis et al., *With a Shrinking EPA, Trump Delivers on His Promise to Cut Government*, WASH. POST: HEALTH & SCIENCE (Sept. 8, 2018); Brady Dennis, *Trump Budget Seeks 23 Percent Cut at EPA, Eliminating Dozens of Programs*, WASH. POST: HEALTH & SCIENCE (Feb. 12, 2018).

99 As of the time of this writing, the U.S. EPA is still engaged in an interagency partnership for disaster mitigation and environmental quality management with the Department of Homeland Security. MEMORANDUM OF AGREEMENT BETWEEN THE DEPARTMENT OF HOMELAND SECURITY/FEDERAL EMERGENCY MANAGEMENT AGENCY (DHS/FEMA) AND THE U.S. ENVTL. PROTECTION AGENCY (EPA) 3 (2010), https://www.fema.gov/media-library-data/1471967433163-e3898bc1d162ebedd50eaa57a8e672d2/MemorandumofAgreementBetweenFEMAandEPA_508_8.9.16.pdf. In addition, the EPA

B. California State Water Law: Appropriative Rights vs. Water Security

This Section provides a brief look at the legal regime of prior appropriation in California state water law, its role in comprehensive water resources management, and the shortcomings of prior appropriation to respond to climate change and water scarcity. For many years, California courts oscillated between application of the natural flow doctrine[100] of the riparian rights system[101] and the reasonable and beneficial use doctrine[102] of the prior appropriation system to water disputes.[103] By the early twentieth century, upstream users worried that the natural flow doctrine would block access to water for upstream communities and agricultural projects, prevent the construction of dams and reservoirs, and monopolize the use of water resources by downstream users.[104] In June 1976, California voters amended the California Constitution to formally adopt the reasonable use doctrine[105] and discontinued the application of riparianism to new

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continues to allocate funding for local communities to address issues of local environmental justice. *EPA Announces Availability of $1.5 Million in Environmental Justice Small Grants*, U.S. EPA: News Released (Nov. 15, 2018), https://www.epa.gov/newsreleases/epa-announces-availability-15-million-environmental-justice-small-grants.

100 *See* Costello v. Bowen, 182 P.2d 615, 621–22 (1947) "[A land owner] may not obstruct a natural channel . . . or otherwise change the natural discharge of such waters to the injury of his neighbors. . . . [W]hat constitutes the natural flow . . . is to be determined by natural conditions, unaffected by artificial changes") (quoting 26 Cal. Jur. 284 § 496).

101 Adler, *supra* note 4, at 18 (defining riparian rights as "a system of property rights in which only riparian (waterside) land owners had the right to withdraw and use water from a stream or other water body . . . based on a concept of 'no harm,' meaning that riparian landowners could use water so long as they did not substantially impair either the quantity or quality of water for downstream users.").

102 Peabody v. City of Vallejo, 40 P.2d 486, 491 (1935) (stating that "[t]he right to the use of water is limited to such water as shall be reasonably required for [a] beneficial use to be served. . . .[S]uch right does not . . . extend to the waste of water . . . [nor] to unreasonable use or unreasonable method of use or unreasonable method of diversion of water.") The reasonable use doctrine remained valid following the California Constitution's Article X amendment in 1976. *See* Envtl. Def. Fund, Inc. v. E. Bay Mun. Util. Dist., 605 P.2d 1, 6 (Cal. 1980); *see also* Nat. Audubon Soc'y v. Superior Court, 658 P.2d 709, 717 (Cal. 1983); *see also* City of Barstow v. Mojave Water Agency, 5 P.3d 853, 864 (Cal. 2000).

103 A. Dan Tarlock, *We Are All Water Lawyers Now: Water Law's Potential but Limited Impact on Urban Growth Management*, WET GROWTH 75 (Craig Anthony Arnold ed., 2005) [hereinafter *We Are All Water Lawyers*].

104 *Id.*

105 CAL. CONST. art. X, § 2.

riparian owners, while old riparian rights were "grandfathered in."[106] As a staple of the prior appropriation system, the reasonable use doctrine provided needed flexibility for the use and storage of water, since supplies of water could be appropriated outside of originating watersheds.[107] Today, the State Water Resources Control Board[108] and Department of Water Resources[109] conjunctively manage the waters of the state of California, under the state water code.

In contrast to the riparian rights system that attaches water rights to ownership in land, whether or not water is used, appropriative rights are "usufructuary" in kind. [110] In the prior appropriation system, the public owns the waters of the state, rather than private land owners.[111] Individuals can appropriate the conditional right to use water under a permitting system from the state.[112] Conditional individual rights to appropriate water followed the "use it or lose it" rule; that is, the right to water was subject to forfeiture if not used in compliance with the terms of the permit.[113] This condition aimed to reduce the "waste" of water and, until recently, was framed by the limitation that "beneficial uses" of instream flow rights were limited to economic purposes (e.g., mining, irrigation, domestic consumption, and hydroelectric generation).[114] Today, "beneficial use" includes water rights for wildlife habitat, recreation, and aesthetics.[115] Such instream flow rights are a useful environmental planning tool, since they can safeguard minimum water quantity levels, even in times of drought, for sensitive aquatic species and habitats.[116] However, while the definition of "waste" includes requirements for efficiency, "there is a strong

106 *See* BARTON H. THOMPSON, JR., ET AL., LEGAL CONTROL OF WATER RESOURCES: CASES AND MATERIALS 200–12 (5th ed. 2013) (providing for an extensive review of California's transition from riparianism to prior appropriation of water rights).

107 *We Are All Water Lawyers*, *supra* note 103.

108 CAL. WATER CODE § 174 (West 2014).

109 CAL. WATER CODE §§ 120–147.5 (West 2012).

110 The term "usufructuary" is defined as a water right that grants an individual permit holder the right to use water. Gary W. Sawyers, *A Primer on California Water Rights*, UC DAVIS: AGRIC. ISSUES CTR. 10, http://aic.ucdavis.edu/events/outlook05/Sawyer_primer.pdf (last visited Nov. 16, 2018); Adler, *supra* note 4, at 22.

111 Adler, *supra* note 4, at 22.

112 *Id.*

113 *Id.*

114 *Id.*; CRAIG BELL & JEFF TAYLOR, WATER LAWS AND POLICIES FOR A SUSTAINABLE FUTURE: A WESTERN STATES' PERSPECTIVE 174–75 (2008).

115 BELL & TAYLOR, *supra* note 114, at 175.

116 *Id.* at 174.

incentive to use all of one's water right so as to not lose it, and rules against inefficient use are rarely enforced."[117]

Recent changes to climate and hydrological conditions, [118] over appropriation of water resources, and inefficient use of water has resulted in water shortages across California. These shortages have driven state and local governments to respond creatively. For example, in Southern California, local governments negotiated with senior water users from agricultural areas to update diversion and use infrastructure to improve water efficiency by paying those users to make such improvements.[119] The right to those waters saved by this transaction was transferred to participating Californian cities.[120] In this context, water transfers have the potential to free otherwise frozen, potentially low-value water uses (e.g., inefficient irrigation) to other, higher-value uses (e.g., domestic water supply).[121] However, the complexity of appropriative water transfer prevents this option from being an economically and legally attractive solution for most communities.[122] Specifically, these transfers are encumbered by complex relationships between the petitioner for the transfer and other legal users' rights to use water from a particular source. For example, during the transfer process, other legal users may formally challenge the water right involved in the transfer. [123] In addition, the transfer process requires the petitioner to assess whether "fish and wildlife would be affected by the change" and include "a statement of any measures proposed to be taken

117 Adler, *supra* note 4, at 22.

118 Emma L. Tompkins & W. Neil Adger, *Does Adaptive Management of Natural Resources Enhance Resilience to Climate Change?*, 9 ECOLOGY & SOC'Y 2, 10–23 (2004).

119 *Id.* at 23.

120 *Id.*

121 *Id.* at 25.

122 *Id.*

123 Approval for a water transfer requires a finding by the Department of Water Resources that the transfer will result in "no injury" to other legal users of that water system. State Water Res. Control Board Cases, 39 Cal. Rptr. 3d 189, 251 (Cal. Ct. App. 2006). Other legal users (senior and junior water right holders) have standing to challenge the department's "no injury" determination. CAL. WATER CODE § 1707(a)(1) (West 2000). In finding "no injury," the agency must consider several factors, including records from the seller to support the historic use of their water right. CAL. WATER CODE § 1703.6(c)(3) (West 2011). These records for historic use rely only on diversion measurements, which until recently were not required, since it was assumed that the water user was in compliance with the parameters of their permit. CAL. WATER CODE § 917(a) (West 2018) (requiring monthly or more frequent diversion reports "when flows or projections are sufficient to support some but not all . . . diversion demand").

for [their] protection."[124] In short, the transfer process is a lengthy, administratively demanding, and cost-intensive process. Increased incentives, such as the availability of state funding and transfer facilitation programs to incentivize transfers, may improve the marketability of this option in the future.[125]

Next, in 2001 the California state legislature updated water appropriation obligations in the environmental review requirements for the California Environmental Quality Act (CEQA) under SB 610 and SB 221. These "assured supply laws" require developers to provide a water supply assessment for new housing developments of 500 or more units as part of the CEQA review process.[126] This assessment instructs developers "to prove they have secured adequate water stock before commencing construction"[127] based on "water availability during normal, dry, and multi-dry years over a projected twenty-year period."[128] The California Urban Water Management Planning Act[129] directs urban water utilities to develop a long-term, frequently updated, water supply plan for their service areas to streamline developers' review of available water resources.[130] Despite this effort, California has a history of weak regulatory oversight of utility compliance.[131] Commentators argue that the execution of assured supply laws will be further complicated due to a "lack of coordination and comprehensive planning" by suppliers that share water resources "and overly optimistic assumptions of the availability and reliability" of existing

124 CAL. WATER CODE § 1701.2(c) (West 2016).

125 CAL. WATER CODE §§ 470–484 (West 1986). California's Costa-Isenberg Water Transfer Act of 1986 established a state funding and assistance program to incentivize and simplify voluntary water transfers.

126 SB 610 (Ca. 2001) amended CAL. WATER CODE §§ 10631, 10656, 10910, 10911, 10912, and 10915; repealed § 10913; and added and repealed § 10657 (relating to urban water planning requirements and water assured laws); SB 221 (Ca. 2001) amended CAL. GOV'T CODE § 65867.5 and added § 66455.3 and § 66473.7 (requiring municipalities to conduct water security and assured supply assessments and adding assured water supply requirements for CEQA environmental review for development approval).

127 Lincoln L. Davies, *Just a Big, "Hot Fuss"? Assessing the Value of Connecting Suburban Sprawl, Land Use, and Water Rights Through Assured Supply Laws*, 34 ECOLOGY L.Q. 1217, 1217 (2007).

128 Mudd, *supra* note 13, at 9–10 (citing CAL. WATER CODE § 10910(b)(3) (West 2012)).

129 CAL. WATER CODE §§ 10610–10657 (West 2015).

130 Mudd, *supra* note 13, at 10.

131 Weak regulatory oversight has resulted in reliance on citizen enforcement. Ellen Hanak, *Show Me the Water Plan: Urban Water Management Plans and California's Water Supply Adequacy Laws*, 4 GOLDEN GATE UNIV. ENVTL. L.J. 69, 71 (2010).

water supplies to cope with their current over appropriated status exacerbated by climate change.[132]

Even with state water law requirements that prevent waste, accommodate interbasin water right transfers, and implement assured supply laws, the undisputable truth for water managers remains: one cannot use water that does not exist. While prior appropriation appears to be equitable on its face, following the tenet "first in time, first in right," the system *requires* little to no variation of historic trends in watershed hydrology or precipitation *to operate*. In application, prior appropriation gives full allocations to senior appropriators before junior appropriators may receive any water, which yields an "everybody loses" result in the face of declining supplies.[133] Without state intervention to address this defect in prior appropriation, limited water supplies may act as a "de facto constraint on growth" in some areas.[134] Thus, adaptation efforts in response to the impact of climate change on water resources must focus on proactive management strategies at the state level, in conjunction with local governments to contain the health and economic impacts of water supply scarcity to existing and future users.

III
STATE AND LOCAL LEADERSHIP IN CLIMATE ADAPTATION PLANNING

While climate change will need to be addressed at all levels of government, studies suggest that local governments may be in the best position to understand vulnerabilities,[135] minimize consequential costs of natural disasters,[136] and plan for local environmental quality.[137] In California, local governments are particularly well positioned to address the impacts of climate change to water resources and water-related natural hazards for a number of reasons. First, directed by the

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132 Mudd, *supra* note 13 at 10.

133 Adler, *supra* note 4, at 24.

134 *Id.* at 23 (citing A. Dan Tarlock & Sarah B. Van de Weterling, *Western Growth and Sustainable Use: If There Are No "Natural Limits," Should We Worry About Water Supplies?*, 27 PUB. LAND & RESOURCES L. REV. 33 (2006)).

135 CITY OF FREMONT, CLIMATE ACTION PLAN 7–3 (2012).

136 Salkin, *supra* note 2, at 10159–60 (explaining that the national cost of damage from natural disasters in flood-prone areas is approximately $5 billion, annually).

137 *Id.* at 10158.

California legislature,[138] local governments are at the "front line of regulating a myriad of environmental concerns" through long-term, comprehensive general plans.[139] These general plans precede all government decisions on the use and development of land.[140] And some communities are beginning to include climate change policies voluntarily.[141] Next, "while local governments are not the principal regulators of water, they are integral partners in planning and implementing water-related initiatives alongside tribal, state, federal, and private partners."[142] Local governments can bridge legal fragmentation of federal flood and water quality control[143] and state laws governing water allocation and use regimes[144] by cooperatively planning for long-term development and water resource use within their jurisdiction. Finally, in the context of natural hazards, land use planning is a key tool for government to effectuate natural disaster mitigation, which has been identified by experts to be "almost exclusively a local government function."[145]

At the time of this writing, many local governments in California have already begun to include climate change in local plans.[146]

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138 CA. GOV. CODE § 65300 (West 2018) (granting local city governments the authority to adopt and implement a comprehensive general plan for the long-term physical development of lands within or outside its jurisdictional boundaries, so long as the latter is determined by the planning agency to bear relation to its planning).

139 Mudd, *supra* note 13, at 4–5.

140 David L. Callies et al., *Balancing Water Values and Human Needs in an Enlightened Land Use Planning Regime*, *in* WET GROWTH: SHOULD WATER LAW CONTROL LAND USE? 358 (Craig A. Arnold ed., 2005).

141 GOVERNOR'S OFFICE OF PLANNING AND RESEARCH, STATE OF CALIFORNIA: GENERAL PLAN GUIDELINES 337, 341 (2017) [hereinafter GENERAL PLAN GUIDELINES].

142 Mudd, *supra* note 13, at 5.

143 Federal mandates require cities' compliance with water quality regulations, such as the Clean Water Act, 33 U.S.C. § 1311 (addressing water pollution through dilution) and the Endangered Species Act, 16 U.S.C §§ 1531–44 (protecting aquatic species in climate-stressed waters).

144 "[S]ince at least the middle of the nineteenth century, state water law has reigned supreme as the primary authority governing the allocation and use of water resources, as proclaimed by Congress, the executive branch, and the courts." Adler, *supra* note 4, at 4 (footnote omitted) (citing Federal Power Act § 27, 16 U.S.C. § 821; Clean Water Act of 1977, 33 U.S.C. § 1251(e), (g); Desert Lands Act of 1877, 43 U.S.C. §§ 321–39; Reclamation Act of 1902 § 8, 43 U.S.C. § 383; California v. United States, 483 U.S. 645, 653 (1978); United States v. New Mexico, 483 U.S. 696, 702 (1978); California v. Beaver Portland Cement Co., 295 U.S. 142, 162 (1935)).

145 James Wilkins, *Is Sea Level Rise "Foreseeable"? Does It Matter?*, 26 J. LAND USE & ENVTL. L. 437, 449 (2011).

146 As is demonstrated in the "Results" section of this Article, these plans range from nonbinding specific plans (e.g., climate action plans) to legally binding plan mandates (e.g.,

Ultimately, these plans have largely focused on "climate mitigation through emissions reductions," energy conservation, and "green building design."[147] While California's climate mitigation policies are leading the country with measurable success of its climate mitigation policies,[148] the state has been slow to move beyond mitigation to adapt to the projected impacts of climate change to land and water resources. Stated simply, the state must bring climate change prevention and preparedness to a level playing field.[149]

To this end, many cities in California have adopted a range of plans to address, set, and implement mitigation and adaptation targets. In large part, this movement was encouraged at the federal level with President Obama's Executive Orders (EO) 13,632[150] and 13,653.[151] These EOs directed federal agencies to adopt climate action plans that opened federal information sharing and investment programs for state

general plans or building codes). *See generally* CITY OF ANTIOCH, ANTIOCH COMMUNITY CLIMATE ACTION PLAN (2011) (proposing a range of voluntary initiatives for climate mitigation related to water resources and use). *But see* CITY OF RICHMOND, CITY OF RICHMOND CLIMATE ACTION PLAN (2016) (establishing enforceable climate change policies in the comprehensive general plan).

147 Mudd, *supra* note 13, at 20.

148 For example, in 2015 California reached its 2016 interim goal for 25% of electricity to be generated by renewable energy and has already contracted with resource providers to meet 41–45% of electricity demand by renewables by 2030 (which has a target goal set for 33%). Arroyo, *supra* note 11, at 311; *see also* NATIONAL CITY, CLIMATE ACTION PLAN, 1–11 to –20 (2011) (describing state, regional, and local initiatives addressing climate change in the state).

149 *See, e.g.*, Ileana M. Porras, *The City and International Law: In Pursuit of Sustainable Development*, 36 FORDHAM URB. L.J. 537, 593 (2009) ("Most climate change experts and policy-makers recognize that adaptation and mitigation are not mutually exclusive strategies but must, on the contrary be employed in tandem."); Peter Hayes, *Resilience as Emergent Behavior*, 15 HASTINGS W. NORTHWEST J. ENVTL. L. & POL'Y 175, 175 (2009) ("[T]he main game is now not adaptation which renders mitigation no less urgent but shifts the political equation in dramatic ways that cannot be ignored any longer.").

150 Exec. Order No. 13,632, 77 Fed. Reg. 74,341 (Dec. 12, 2012). This executive order directed the Interagency Climate Change Adaptation Task Force (task force) to identify and eliminate "obstacles to resilient rebuilding in a manner that addresses existing and future risks and vulnerabilities and promotes the long-term sustainability of communities and ecosystems." *Id.* at 74,342.

151 Exec. Order No. 13,653, 78 Fed. Reg. 66,819 (Nov. 1, 2013) was a result of the task force's recommendations, which found that—in responding to natural disaster Hurricane Sandy—regional and local stakeholders were best positioned to effectuate adaptation projects and reduce "risk[s] of unplanned redundancies or gaps in resilience." HURRICANE SANDY REBUILDING TASK FORCE, HURRICANE SANDY REBUILDING STRATEGY: STRONGER COMMUNITIES, A RESILIENT REGION 54 (2013).

and local climate change resilience planning.[152] For example, the Environmental Protection Agency's (EPA) climate action plan directs the agency to assist local government and water managers to develop adaptation programs to safeguard water quality standards.

> [A] key challenge will be how to help local decision makers understand potential local impacts, and how to make long-term plans under a new range of uncertainty about future hydrologic conditions . . . . EPA, working with its state, tribal, and local partners, is responsible for developing and implementing a portfolio of regulatory and non-regulatory programs to protect and improve water quality [for] the nation's . . . waters. As better information is developed for local decision making, changes may be needed in how EPA and our partners implement water quality programs . . . .[153]

Today, federal climate research, policy, and funding programs have been seriously challenged by the Trump administration. Specifically, President Trump's EO 13,783 rescinded many Obama-era climate change programs, including the climate action plan mandate of EO 13,653.[154] While the reduction in federal administrative support is a huge setback for coordination and funding from federal partners, the regional and local governments in California continue to independently adopt comprehensive climate action plans and commit to climate mitigation and adaptation efforts, despite diminished federal support.[155]

Given the challenges of climate uncertainty, the pervasiveness of mitigation planning with weak (or missing) adaptation components, fragmentation, and the current lack of federal leadership, the call for cities to adapt to climate change is a huge undertaking.[156] Over the last decade, climate action plans have been adopted at the state, regional, and municipal level and have served as guiding documents to

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152 78 Fed. Reg. 66,819, 66,821.

153 U.S. EPA, CLIMATE CHANGE ADAPTATION PLAN, No. EPA 100-K-14-001 24 (2014).

154 Presidential Executive Order on Promoting Energy Independence and Economic Growth, Exec. Order No. 13,783, 82 Fed. Reg. 16,093, 16,094 (Mar. 28, 2017). "[E]ach agency shall, as soon as practicable, suspend, revise, or rescind, or publish for notice and comment proposed rules suspending, revising, or rescinding any such actions, as appropriate and consistent with law and with the policies [of this order]s" *Id.*

155 According to the International Council for Local Environmental Initiatives' Global Covenant of Mayors for Climate and Energy, there are currently 177 cities in the United States that have signed on to independently pursue climate mitigation and adaptation policies. Global Covenant of Mayors for Climate and Energy, Regions: North America *query* "United States" https://www.globalcovenantofmayors.org/cities/ (follow cities hyperlink and then search by country "United States") (last visited Nov. 18, 2018).

156 *See* Gremillion, *supra* note 13, at 1253.

comprehensively address climate change. The plans contain a wide range of efforts to reach emissions goals in transportation, residential use, and industry, as well as environmental goals such as minimizing impacts to water resources and sustainable resource consumption.[157] At the local level, climate action planning results from the intersection of different stakeholder interests, climate expertise, and governance structures.[158]

This Article proposes that the local climate action plan may serve as the foundational step for communities to holistically achieve climate adaptation. The plan is foundational, since it serves as a platform to consolidate information on local climate and water resource conditions and the fragmented regulatory and nonregulatory policies across water resources, emergency preparedness, and land use planning actions. But it is also foundational because, without more, climate action plans are simply aspirational, nonregulatory documents. Thus, this Article recommends that (1) climate preparedness for water resources can be achieved through "adaptation-embeddedness" in municipal climate action plans and (2) integrating these plans into the general planning framework is a regulatory solution for local governments to take a proactive leadership role in comprehensively managing water resources.

A. Adaptation-Embeddedness for Water Resources in Municipal Climate Action Plans

There is little policy scholarship that investigates the "embeddedness" of adaptation elements in climate action plans.[159] This section evaluates adaptation-embeddedness in climate action plans from sixty-nine California cities in Metropolitan Statistical Areas (MSA).[160]

1. Methodology

This study used a qualitative approach of content analysis to evaluate adopted climate action plans and general plans from California cities

157 Koski & Siulagi, *supra* note 28, at 271–72.

158 *Id.* at 271.

159 *See id.* at 285.

160 This population criterion is consistent with the U.S. Census Bureau's definition for densely populated urbanized areas. U.S CENSUS BUREAU, *2010 Census Urban Area FAQs*, https://www.census.gov/geo/reference/ua/uafaq.html (Sept. 9, 2017).

with populations of more than fifty thousand. Data was collected in a three-step process that included collection, filtering, and coding.[161] Only climate action plans that included water-related adaptation elements and the corresponding general plan[162] (if present) were eligible for this study.

Using content analysis,[163] the coding scheme was designed to describe the level of integration in land use plans for water-related natural hazards, numbering each on a scale from one to five. Cities that did not plan for water-related natural hazard adaptation were designated Level 1, even if the plan comprehensively plans for other climate-related hazards. A Level 2 code indicated that the plan directed attention at water-related adaptation, but at a low level. For example, plans that include a short or broad statement on reducing water-related climate impacts, without further acknowledgement received a level two code.

Level 3 coded plans are plans that developed water-related planning further but focused exclusively on traditional climate mitigation themes with no adaptation elements. A Level 3, for example, included a section on increasing energy efficiency at wastewater treatment plants through water conservation measures, installation of biogas capture, and biogas to energy technologies.[164] Level 3 plans are distinguishable from Level 4 plans because they did not mention water hazards outside the context of climate mitigation.

Level 4 plans discussed water-related hazard adaptation impacts, reduction and adaption strategies, and implementation, but they lacked concrete policies to combat the direct impacts of climate change or they focused solely on community education and outreach. That is, they were distinguishable as a "plan to plan."[165] Finally, Level 5 plans showed the highest level of water-related adaptation planning with significant commitment to specific local water-related hazards and

161 Koski & Siulagi, *supra* note 28, at 276.

162 These municipalities were selected through designation by the 2016 California Jurisdictions Addressing Climate Change report prepared by the Governor's Office of Planning and Research. GOVERNOR'S OFFICE OF PLANNING & RESEARCH, *2016 California Jurisdictions Addressing Climate Change* (2016) http://www.opr.ca.gov/docs/2016_California_Jurisdictions_Addressing_Climate_Change_Summary.pdf [hereinafter GOPR].

163 In planning literature, content analysis is described as "a research technique for the objective, systematic and quantitative description of the manifest content of communication." BERNARD BERELSON, CONTENT ANALYSIS IN COMMUNICATION RESEARCH 18 (1952).

164 CITY OF COLTON, CLIMATE ACTION PLAN 3-2 (2015).

165 Koski & Siulagi, *supra* note 28, at 278.

concrete, actionable ways to mitigate and adapt through identified conceptual, structural, and planning mechanisms.

2. Results

There were 176 MSA cities in California that qualified for this study. Of this number, 39% of municipalities (sixty-nine MSAs) had adopted climate action plans. The results from coding the sixty-nine climate action plans and thirty-five general plans eligible for this study generally demonstrated that while many of the actionable strategies presented in the plans aggressively address greenhouse gas emissions reduction targets through mitigation, the plans generally failed to present specific, implementable solutions for climate adaptation that reach beyond "planning to plan."

Specifically, fewer than 20% of all climate[166] and general plans[167] went beyond identifying water adaptation as a "primary issue" of climate change planning and included concrete, actionable ways to implement adaptation measures. The highest-scoring plans include actionable measures to reduce urban water consumption and flood risks to infrastructure and low-lying developments. Notably, none of these adaptation measures called for diverting development from floodplains; rather, local governments appeared to prefer hard structural or "green" infrastructure solutions to absorb disastrous flood events.[168] There was no statistically significant variation in population size, city general revenue, location, or plan age between cities with high-scoring or low-scoring plans.

The majority (more than 80%) of climate action and general plans failed to move beyond mitigation planning. All coded plans comprehensively planned for climate mitigation such as smog

166 A total of eleven climate action plans were coded at Level 5 for adaptation-embeddedness of water resources in this study: Encinitas, San Marcos, Manteca, Santa Barbara, Pleasanton, Sacramento, Richmond, Berkeley, Corona, Fullerton, and Hesperia.

167 A total of eight general plans were coded at Level 5 for adaptation-embeddedness of water resources: Manteca, Santa Barbara, Dublin, Fremont, Pleasanton, Sacramento, and Richmond. Five of these cities also received a Level 5 code for corresponding climate action plans.

168 *See, e.g.*, CITY OF RICHMOND, RICHMOND GENERAL PLAN 2030: LAND USE AND URBAN DESIGN 3.74 (2012), http://www.ci.richmond.ca.us/DocumentCenter/View/8809/30-Land-Use-and-Urban-Design-Element?bidId= (Land Use Element 6.4 of the Richmond General Plan calls for using green infrastructure as a strategy to reduce stormwater runoff).

reduction through vehicle emissions regulations[169] or codifying state-mandated building efficiency standards in general plan policies[170] to increase the livability of a city (e.g., air pollution reduction measures resulting in cobenefit of cleaner air). But alone, as explained above, these efforts cannot adequately address the full range of causes, risks, and impacts of climate change.[171] Where these lower-scoring plans did include adaptation planning goals, the goals were "aspirational," free-standing statements that lacked actionable policies and integration with regulatory mechanisms.

There is a series of reasons that climate action planning in California has primarily focused on mitigation, with the nominal inclusion of adaptation. First, as discussed throughout this Article, there are complex fragmentation issues between federal, state, and local actors with the authority to manage water resources for climate adaptation. Second, while climate mitigation policy has dominated state climate policy initiatives over the last two decades, there has been relatively little guidance from the state to achieve adaptation policies at the local level. [172] This lack of regulatory guidance has left cities to voluntarily undergo climate adaptation planning. As seen by the relatively low participation rate from cities to voluntarily produce climate action plans, it is clear that the lack of regulatory guidelines has slowed progress.

B. A Municipal Climate Action Plan That "Sticks": Advocating for a Water-Climate Element in the General Plan

To address the impact of voluntariness of climate adaptation and the lack of enforceable adaptation measures therein, this Article suggests that the state include a water-climate element in the general plan requirements for local governments. The general land use plan is the superior municipal regulatory document to which all other planning

169 Global Warming Solutions Act of 2006, A.B. 32, 2006 Assemb. (Cal. 2006).

170 *See, e.g.*, CITY OF LA HABRA, CITY OF LA HABRA CLIMATE ACTION PLAN app. E (2014), http://www.lahabracity.com/DocumentCenter/View/192/Climate-Action-Plan-PDF ?bidId= (requiring new residential construction to meet state-mandated energy efficiency targets).

171 *See* Pielke, *supra* note 18 (discussing limitations of mitigation strategies and calling for advancing the role of adaptation in climate policy).

172 *See* Table 1 California Regulatory Framework Summary–Climate Legislation (on file with author).

actions.[173] California courts have upheld this principle often, stating in one decision that the general land use plan serves as the "constitution for all future developments within the [c]ity. Similarly, planning actions for present and projected use and treatment of water fall within the city's planning authority and must be consistent with the general plan.[174] All other planning actions, such as zoning, structural codes, and subdivision regulations must be consistent with the goals and policies of the general plan.

In effectuating plan policies, zoning offers an opportunity to conjunctively manage water resources and hazards through a proposed water-climate element and the existing land use element. In practice, "[z]oning is the most powerful tool that local governments have to preemptively mitigate hazards."[175] Under a local government's zoning authority, a municipality may develop enforceable law that controls the location, type, and density of new development and re-development. Professor Patricia Salkin lists effective disaster mitigation strategies included in a local government's zoning toolbox such as "limitations on how property may be developed in flood zones; setbacks from fault lines . . . , steep slopes, . . . coastal erosion areas; and overlay zones that introduce additional requirements over sensitive environmental areas such as wetlands, dunes, and hillsides."[176] Another useful outcome of linking the water-climate element with the land use element, is the ability of the general plan to define "nonconforming" land uses in specific land use zones. Nonconforming uses occur when the zoning district or zoning regulation of a site changes and the current land use on the site no longer conforms to the uses permitted.[177] The intent of the nonconforming use characterization is not to "force all non-conforming situations immediately" but to "guide nonconforming situations in a new direction consistent with [c]ity policy, and, eventually, bring them into conformance."[178] The process of phasing

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173 Lesher Commc'ns, Inc. v. City of Walnut Creek, 802 P.2d 317, 322 (Cal. 1990) (citing deBottari v. Norco City Council, 217 Cal. Rptr. 790, 793–94 (Ct. App. 1985)).

174 *See* GENERAL PLAN GUIDELINES, *supra* note 141 at 111–14.

175 Jessica Grannis, ZONING FOR SEA-LEVEL RISE: A MODEL SEA-LEVEL RISE ORDINANCE AND CASE STUDY OF IMPLEMENTATION BARRIERS IN MARYLAND 2 (Dec. 2012) (prepublication draft), https://www.georgetownclimate.org/files/report/Zoning%20for%20Sea-Level%20Rise%20Executive%20Summary%20Final.pdf.

176 Salkin, *supra* note 2, at 10,165.

177 OR. CITY, OR., MUNICIPAL CODE § 17.58.010 (2004).

178 *Id.*

out nonconforming uses (amortization) is a particularly relevant legal concept to planning since significant amounts of land in American cities were developed within high-risk areas and are susceptible to a nonconforming use classification under updated disaster mitigation zoning measures. However, in most cases, the amortization period takes an excessive amount of time, due to the amortization process taking on a similar legal "reasonableness" test for finding a nuisance in property use.[179] Regardless, local governments retain the authority to characterize risky uses in disaster-prone locations and to establish a time frame for the property to be brought into conformance.

In disaster scenarios, amortization for nonconforming use is typically enforced post-disaster, in rebuilding restrictions. For example, looking beyond California, after the 1993 "Great Flood" in Des Moines, Iowa, city officials recognized that some large-scale property damage occurred to nonconforming structures. In rebuilding actions after the flood, the city applied zoning ordinances to prohibit redevelopment of nonconforming structures with damage of more than sixty percent of replacement value. The response to the Des Moines 1993 flood is an example of successful enforcement of land use regulations that prevent potential future damage to the same properties. Moving forward, low-lying Californian cities can use nonconforming use classifications with smart growth principles to prevent any redevelopment of nonconforming structures in hazard mitigation zones.

However, relocating communities from natural hazards comes at a huge cost with legal obstacles. At the time of this writing, the cities of Richmond and Oakland have filed separate tort lawsuits against major producers and distributors of fossil fuels (including BP, Chevron Conoco Phillips, Exxon Mobil, and Shell) for damages in the amount to cover costs incurred to develop sea walls and other infrastructure and to relocate residents and property from the global-warming induced sea-level rise.[180]

Finally, in conformance with general plan policies, local governments can enact zoning requirements in critical and sensitive

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179 City of Los Angeles v. Gage, 274 P.2d 34, 43 (Cal. 2d Dist. Ct. 1954) (explaining the factors for determining "reasonableness" in amortization, including (1) length of time the amortization is allowed; (2) nature of the business; (3) improvements to the property; (4) character of the neighborhood; etc.).

180 First Amended Complaint for Pub. Nuisance, City of Oakland v. BP P.L.C., No. 3:17-cv-06011-WHA (N.D. Cal. filed Apr. 03, 2018); Complaint, City of Richmond v. Chevron Corp., No. C18-00055 (Super. Ct. Cal. filed Jan. 22, 2018).

environmental areas to prohibit or limit use in disaster-prone areas. The American Planning Association defines critical areas as places that "contain or constitute natural resources sensitive to excessive or inappropriate development."[181] This definition of critical areas can be expanded to include areas that are prone to natural hazards, the development of which may result in damaging disaster losses to the natural and built environments. In light of this, the Administrative Procedures Act's guidance for model ordinances calls for prohibiting particular uses, activities, and structures in critical or sensitive areas.[182] Notably, this approach works whether a natural hazard endangers a critical or sensitive area or benefits it, such as seasonal flooding in wetland areas.[183]

CONCLUSION

There are significant obstacles to climate adaptation planning for water resources. Obstacles range from the "vertical" fragmentation in the division of management authority across federal, state, and local government[184] and "horizontal" fragmentation by the multiple government entities tasked with land, emergency preparedness, and water decision-making authority within a single level of government.[185] In addition, the preferential treatment of regulators toward climate mitigation over adaptation planning actions has severely slowed progress for climate change preparedness. Finally, voluntary planning actions such as the climate action plan are nominally successful in generating clear, actionable, and enforceable goals for water resources climate adaptation management. However, it is argued that integrating climate action plans or a climate planning element into municipal general plans presents an opportunity to turn these obstacles into "opportunities." This integration will require state leadership to generate regulatory mandates, guidance, and support; and local leadership to enact creative, concrete, and place-based strategies that

181 AMERICAN PLANNING ASSOCIATION, GROWING SMART LEGISLATIVE GUIDEBOOK: MODEL STATUTES FOR PLANNING AND THE MANAGEMENT OF CHANGE 9–3 (Stuart Meck ed., 2002).

182 *Id.*

183 *Id.*

184 Arnold, *supra* note 29, at 37–38.

185 *Id.* at 38–39.

manage water resources and prepare cities for the impacts of climate change.