

# Tradeable Permits for Shoreline Protection: Reshaping Regulation Under the Coastal Act for the Era of Sea Level Rise

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Working Paper of the  
Center for the Blue Economy

September, 2016

## Introduction

California's coast is one of the state's and the nation's premier locations. Home to millions of people, as well as a great diversity of natural features and habitats, it is also a place that is disappearing from beneath our feet. The dynamic interactions of water and land have eroded much of the historic California coast, and sea level rise threatens a dramatic acceleration of this trend.<sup>1</sup> Fighting erosion has led to more than ten percent of California's shoreline (and over thirty percent in southern California) being transformed from natural to man-made structures that resist, at least for a time, the forces of wind and wave.<sup>2</sup>

But the fortress undermines itself. Sea walls and armoring protect properties for a time, but result in accelerated erosion nearby, and eventually disrupt the dynamics of the entire coastal system. The regulatory system governing shoreline management under the California Coastal Act ("Coastal Act") is complex and is generally designed to discourage armoring. In choosing armoring, shorefront property owners not only commit to an enormous expenditure of money to construct and maintain the structure, but also engage in a time-consuming, contentious and expensive process to get approval for their actions. The costs to the owners are matched, or exceeded, by the administrative burden borne by public agencies – in this case local governments and the California Coastal Commission – charged with granting approval.

Alternatives to coastal armoring in the form of natural infrastructure<sup>3</sup> are now viable alternatives to engineered structures in many situations. Wetlands, dunes, oyster beds, and kelp forests are natural features that enhance the ability of both human and natural systems to respond to sea level rise. Such "natural infrastructure" can be cost effective, or at least cost competitive, with hard armoring responses, particularly over the extended periods required in the face of rising seas. Despite the advantages of these approaches, the regulatory regime does little to encourage their use, and they have been rarely deployed.

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<sup>1</sup> Heberger M, Cooley H, Herrera P, Gleick PH and Moore E, "The Impacts of Sea Level Rise on the California Coast" (Sacramento CA, 2009), [http://mail.wecalc.org/reports/sea\\_level\\_rise/report.pdf](http://mail.wecalc.org/reports/sea_level_rise/report.pdf).

<sup>2</sup> Melius et al. 2015

<sup>3</sup> "Natural infrastructure is the preservation and/or restoration of ecological systems, or utilization of engineered systems that use ecological processes, to increase resiliency to climate change and/or manage other environmental problems. This may include, but is not limited to, floodplain and wetland restoration or preservation, combining levees with restored ecological systems to reduce flood risk, and urban trees to mitigate high heat days." State of California. Legislature. Assembly. *An act to amend Section 75125 of, and to add Part 3.7 (commencing with Section 71150) to Division 34 of, the Public Resources Code, relating to climate change.* Assembly Bill No. 1482 (Gordon), 2015-2016 Regular Session.

To achieve the Coastal Act's purposes in an era of steadily increasing threats to shoreline properties from rising sea levels, California will have to find ways to provide incentives for property owners to deviate from business-as-usual practice of shoreline armoring. The current approach certainly permits natural infrastructure to be used, and can be seen as generally supportive of the idea, but the current process does not send strong enough signals to property owners and can take inordinate time to arrive at decisions. The time spent reviewing every single property owner's actions will become a major burden on regulators and the regulated community as flooding events become both more common and more damaging.

We believe it is possible to do better. Similar inefficiencies in other environmental regulatory processes have led to the development of markets for tradable permits that can achieve better environmental results at lower costs. Such systems as "cap and trade" air quality regulation and transferable development rights in land use have been widely and successfully deployed in the U.S. and other countries.

In this paper we draw on this experience to propose a tradable permits system that can make shoreline protection both more available when needed and less environmentally damaging when used. We define objectives for such a system based on the principles espoused by the Coastal Act and on experience with other tradable permits. We evaluate the prototype against the known characteristics of successful permit market systems. We conclude that a market-based tradable permit system for shoreline protection for California is feasible and identify a number of legal and policy issues to be investigated further.

## **Options for Shoreline Protection: Coastal Armoring and Natural Infrastructure**

Hard armoring can be effective in its principal goal of protecting property, at least over some period of time, and can also be put into place relatively quickly.<sup>4</sup> The technical principles behind hard coastal armoring are relatively well understood, with clear design specifications and performance standards. However, hard armoring can limit sand supply and reduce the width of beaches in a number of ways, increasing erosion rates in neighboring properties (and further increasing the demand for armoring) as well as reducing recreational opportunities. These effects intensify as beaches narrow due to erosion and the impoundment of sand behind the armoring structure. Shoreline armoring associated beach loss will also reduce intertidal and sandy beach habitat, impacting shorebirds and coastal flora and fauna. According to a 2008 study of coastal armoring, armored beaches had significantly fewer and smaller intertidal macro-invertebrates, three times fewer

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<sup>4</sup> Hanak E and Moreno G, "California Coastal Management with a Changing Climate" (2012) 111 *Clim. Chang.* 45.

shorebirds, and four to seven times fewer gulls and other birds than unarmored beaches.<sup>5</sup>

The concept of natural infrastructure, on the other hand, means using open space between the ocean and developed land to absorb floodwaters and reduce wave energy. Wetlands, dunes, oyster beds, and kelp forests are natural features that can help land – submerged or terrestrial – function as natural infrastructure, protecting parts of the California coast from sea level rise and storm impacts. Natural infrastructure improves the ability of natural systems to respond to sea level rise and migrate landward, ensuring their survival. In turn, these systems provide benefits for coastal communities as protective buffers against sea level rise-enhanced -storm events while continuing to provide access, recreation opportunities, and other social benefits. These benefits have been well documented.<sup>6</sup>

In two recent studies, The Nature Conservancy (TNC) and partners have evaluated the costs and benefits of both natural infrastructure and traditional armoring. In Ventura County, two hypothetical responses to sea level rise were evaluated, one an engineered management scenario and the other a natural infrastructure scenario. Results showed that both approaches reduce damages significantly; however, the natural infrastructure approach provides additional ecosystem service benefits in terms of preserving or restoring the natural functions of the ecosystem.<sup>7</sup> A similar study in southern Monterey Bay compared the economic performance of a suite of stakeholder-selected climate adaptation strategies. The results again demonstrated that hard armoring the shoreline has the lowest net present value of any of the options, whereas managed retreat or beach nourishment were most economically sound in different segments of the coastline within the study area.<sup>8</sup>

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<sup>5</sup> Dugan, Jennifer, “Ecological Effects of Armoring California Beaches” (2008) *Marine Ecology* 160, 160-170

<sup>6</sup> Arkema KK, Guannel G, Verutes G, Wood S a., Guerry A, Ruckelshaus M, Kareiva P, Lacayo M and Silver JM, “Coastal Habitats Shield People and Property from Sea-Level Rise and Storms” (2013) 3 *Nat. Clim. Chang.* 913, <http://www.nature.com/doi/10.1038/nclimate1944>.

<sup>7</sup> ENVIRON International Corporation, “Economic Analysis of Nature-Based Adaptation to Climate Change-Ventura County California” (2015) The Nature Conservancy-California

<sup>8</sup> Newkirk S, Leo K, Heady W, Cohen B, Calli J, King P, McGregor A, DePaolis F, Vaughn RK, Giliam J, Environmental Science Associates and Revell DL, “Economic Impacts of Climate Adaptation Strategies for Southern Monterey Bay” (Oakland, CA, 2016).

Despite the advantages of natural infrastructure, hard armoring remains the default choice for shoreline protection in California and most other parts of the country for several reasons. Stanford’s Environmental Law Clinic identified several obstacles to the use of natural infrastructure. One of the Clinic’s most important findings was that there is a tendency for people to “do what they know” when confronted with the significant risks of flood damages. Combined with a lack of data-supported, scientific standards for how to deploy natural infrastructure in many areas, the result is that risk averse decision makers are biased against the “new” ideas of natural infrastructure and in favor of the “proven” armoring approaches.<sup>9</sup>

The California Coastal Act is a comprehensive framework for planning and regulating land and water uses, including shoreline protection, along the coast. The goals of the Coastal Act are to protect and enhance coastal resources, ensure balanced resource use, ensure access and recreational use, prioritize coastal-dependent uses (which excludes residential uses), and encourage coordinated state and local planning.<sup>10</sup> The Coastal Act created the California Coastal Commission, charged with exercising a combination of planning, oversight, and regulatory authorities.

Within this framework, local governments are encouraged to use their authority to regulate coastal land use to guide development, consistent with the goals and policies established by the Act. Local Coastal Programs (LCPs) are the principal means by which they do this. An LCP is a combination of land use plans, maps, and zoning ordinances that determine how the Coastal Act will be implemented in a specific city or county.<sup>11</sup> Each local government is charged with developing one or more LCPs for areas of the coastal zone within its jurisdiction, and amending or updating those LCPs as circumstances change.<sup>12</sup> The Coastal Commission reviews each proposed LCP and, as appropriate, certifies it once the LCP is found to be consistent with the Coastal Act.<sup>13</sup> Upon certification, authority to regulate coastal development through issuance of coastal development permits (CDPs) is transferred to the local government.<sup>14</sup> In areas without an approved LCP, the Coastal Commission retains this authority.

This transfer of permitting authority gives local governments authority to regulate many coastal armoring projects. However, the Coastal Commission exercises either original (where no LCP applies) or appellate jurisdiction over applications for permits to develop armoring structures.<sup>15</sup> The Coastal Commission also retains original regulatory jurisdiction over proposed development on

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<sup>9</sup> Stanford Law School Coastal Policy Lab, *Local Barriers to Nature Based Strategies for Coastal Hazard Mitigation in California* (2015).

<sup>10</sup> Cal. Pub. Res. Code § 30001.5.

<sup>11</sup> Cal. Pub. Res. Code § 30108.6

<sup>12</sup> *Id.* at §§ 30500–30525.

<sup>13</sup> *Id.* at § 50512.

<sup>14</sup> *Id.* at § 30600.

<sup>15</sup> *Id.* at §§ 30519, 30601.

tidelands, submerged lands, public trust lands, and certain other areas within a specific distance from the shore, as well as over most major public works projects.<sup>16</sup> Finally, the Coastal Commission has appellate jurisdiction over approvals of development between the sea and the first public road paralleling the sea.<sup>17</sup>

Two main provisions in the Coastal Act govern shoreline armoring permitting. Section 30235 states that armoring *shall* be allowed to protect *existing* structures under certain conditions. Specifically:

Revetments, breakwaters, groins, harbor channels, seawalls, cliffs, retaining walls, and other such construction that alters natural shoreline processes shall be permitted when required to serve coastal-dependent uses or to protect existing structures or public beaches in danger from erosion and when designed to eliminate or mitigate adverse impacts on local shoreline sand supply.<sup>18</sup>

In contrast, Section 30253 prohibits *new* development if it would require a coastal armoring structure. According to this section, new development shall do all of the following:

- (a) Minimize risks to life and property in areas of high geologic, flood, and fire hazard.
- (b) Assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural land-forms along bluffs and cliffs.<sup>19</sup>

Read together, the most reasonable interpretation of Coastal Act Sections 30235 and 30253 is that they express a broad legislative intent to allow shoreline protection for development that was in existence when the Coastal Act was passed in 1976, but that armoring to protect development built after the Coastal Act should be avoided. In this way, the Coastal Act's broad purpose to protect natural shoreline resources, public access and recreation is achieved to the maximum extent when new development is being considered. But shoreline development already in existence in 1976 is "grandfathered" and allowed to be protected from shoreline hazards if doing so otherwise met Coastal Act objectives, even if this resulted in adverse resource impacts. Such grandfathering of existing conditions is common when new land use and resource protection policies are put in place.

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<sup>16</sup> *Id.* at §§ 30519, 30600–01.

<sup>17</sup> *Id.* at § 30603(a)

<sup>18</sup> Cal. Pub. Res. Code § 30235

<sup>19</sup> Cal. Pub. Res. Code § 30253.

Nonetheless, the Coastal Commission has, at various times, interpreted these sections differently.<sup>20</sup> In some cases, the shoreline protection being proposed to protect a post-Coastal Act structure has been justified as being necessary to protect adjacent pre-Coastal Act structures.<sup>21</sup> The Commission has occasionally treated structures built after 1976 as existing structures entitled to shoreline protection even if no adjacent pre-Coastal Act structure also requires protection.<sup>22</sup> Still other interpretations have been adopted by local governments. For example, Marin County interprets “existing structure” as one built prior to the adoption of its original LCP (May 13, 1982).<sup>23</sup>

In 2015, the Coastal Commission issued its final Sea Level Rise Policy Guidance California Coastal Commission., providing state agencies and local governments with best practices for incorporating projected sea level rise into their practices. Although the Guidance specifically recognizes the conflicting interpretations of sections 30235 and 30253, and states that – in some circumstances – the regulator will be without authority to *deny* a shoreline armoring permit to an existing structure, it nonetheless states: “this Guidance recommends the avoidance of hard shoreline armoring whenever possible.”<sup>24</sup>

The pairing of extensive existing development and the diversity of possible interpretations of the Coastal Act’s armoring provisions has led to an ongoing proliferation of shoreline armoring in California. As of 2005, at least 10.2 percent of the California outer coast is armored and a third of the Southern California coast was protected by armoring<sup>25</sup>. It is admittedly difficult to discern the exact increase in armoring after 2005, since the most recent comprehensive dataset is over ten years out of date.<sup>26</sup> Nonetheless, a cursory review of Commission decisions reveals an ongoing trend of permitting armoring under both emergency and non-emergency conditions.

## Theory and Practice of Market Approaches

The merger of pro-environment incentives with market forces began more or less contemporaneously with current environmental law.<sup>27</sup> Two important innovations in regulation have emerged from efforts to apply the ideas of economics to environmental policy. One is tradable emissions permits (TEP’s), which have been implemented primarily in the regulation of air emissions. The other

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<sup>20</sup> Todd Cardiff, *Conflict in the California Coastal Act: Sand and Seawalls*, 38 Cal. W. L. Rev. 255 (2001).

<sup>21</sup> California Coastal Commission, “Sea Level Rise Policy Guidance” (Sacramento CA, 2015).

<sup>22</sup> *Id.*

<sup>23</sup> Marin County LCP, Policy C-EH-13

<sup>24</sup> California Coastal Commission, “Sea Level Rise Policy Guidance” (Sacramento CA, 2015).

<sup>25</sup> Gary B. Griggs. *The impacts of coastal armoring*. Shore and beach 73 (1), 13-22 (2005).

<sup>26</sup> California Department of Natural Resources, *Coastal Erosion Armoring 2005* (2005)

<sup>27</sup> Kneese A and Schulze C, *Pollution, Prices, and Public Policy* (Resources for the Future, Washington, D.C., 1975).

application is in land use management, where transferable development rights are a market approach to allocating the density of development across a defined landscape.

Tradable Emission Permits, or TEP's, are most widely used in air quality regulatory programs.<sup>28</sup> Rather than a permit that specifies a technology, a resource user is given an allocation of emissions which, totaled across all emitters and capped at target levels, reduces emissions by allowing individual emitters to choose how to meet their goals by either direct reductions or indirect reductions (buying other emitters' rights). If the user is successful in reducing emissions below their target they may sell the unused allocation to another user seeking to meet their target. Tradable permits have been proposed or applied in a number of other environmental management situations including water quality<sup>29</sup>, biodiversity<sup>30</sup>, and land use.<sup>31</sup>

Market approaches combined with environmental incentives have also been applied in the land use context in the form of transferable development rights or TDR's. TDR's are a market based approach to allocating land uses in order to achieve a balance between development and conservation within a defined region. Those seeking to develop land in designated zones, or to develop in certain ways such as at a higher density, may do so only by purchasing the development rights to land from owners of rights in another part of the region. Purchased rights can then be effectively "retired," creating conservation areas where development will not take place or is severely limited. This approach provides incentives for landowners to conserve their land, since they can effectively be paid what they would have earned if the land had been developed. "Conservation" in TDR systems has been defined in various ways, including conserving open space, wildlife habitat, or historic properties.<sup>32</sup>

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<sup>28</sup> Tietenberg T, *Emissions Trading Principles and Practice* (2nd ed, Resources or the Future, Waashington, DC, 2006); Kennedy P, "Environmental Damage and Emissions Trading.pdf" (1999) 32 *Can. J. Econ.* 1313; Ellerman a. D, "A Note on Tradeable Permits" (2005) 31 *Environ. Resour. Econ.* 123.

<sup>29</sup> Hung MF and Shaw D, "A Trading-Ratio System for Trading Water Pollution Discharge Permits" (2005) 49 *J. Environ. Econ. Manage.* 83.

<sup>30</sup> Drechsler M and Wätzold F, "Applying Tradable Permits to Biodiversity Conservation: Effects of Space-Dependent Conservation Benefits and Cost Heterogeneity on Habitat Allocation" (2009) 68 *Ecol. Econ.* 1083, <http://dx.doi.org/10.1016/j.ecolecon.2008.07.019>.

<sup>31</sup> Henger R and Bizer K, "Tradable Planning Permits for Land-Use Control in Germany" (2010) 27 *Land use policy* 843, <http://dx.doi.org/10.1016/j.landusepol.2009.11.003>.

<sup>32</sup> Fulton W, Mazurek J, Williamson C and Pruetz R, "TDRs and Other Market-Based Land Mechanisms: How They Work and Their Role in Shaping Metropolitan Growth" (Washington DC, 2004); Kaplowitz MD, Machemer P and Pruetz R, "Planners' Experiences in Managing Growth Using Transferable Development Rights (TDR) in the United States" (2008) 25 *Land use policy* 378.



TEPs and TDRs share the basic principle of providing options for meeting environmental outcomes and encouraging individuals to choose the lowest cost options, where “costs” include both the cost to the individual and to the environment. Market-based approaches should achieve overall environmental outcomes that are equal to or superior to what regulation could achieve and to do so at lower administrative/transaction costs to both the private individuals and the public. The key to making a market based approach to permitting in shoreline protection possible is the increasingly widespread recognition that there is a cost-competitive, environmentally preferable alternative to hard armoring, which is at least as effective over the long term. Natural infrastructure provides this alternative.

## **A Prototype Tradable Permits System**

Markets are institutions with rules and procedures, and it is these features of markets that determine their ability to meet the policy objectives for which they are established.<sup>33</sup> Rules need to cover the spatial extent of the regulatory coverage; the denominations of tradable permits must be defined. It is also necessary to define the relationship between the market and the environment by relating the number of permits available for trade to the environmental goals chosen.

This paper posits that a tradable permit system, created under the auspices of the Coastal Act, would lead to a rationalized permitting system that produces environmentally preferable outcomes. The tradable permit system we propose rests on several elements:

- *Permit Units.* A permit to undertake action to protect shoreline property will be comprised of permit units, which are units of exchange in the system.
- *Permission to Act is a Function of the Proposed Action and the Number of Permit Units Required for that Action.* Actual permission to undertake alterations of the shoreline will only be granted when permit units equal to the number required for the proposed action are in possession of the property owner<sup>34</sup> proposing shoreline alteration for protection purposes.
- *Initial Allocation.* Property owners at risk from coastal flooding now or in the future would be granted an initial allocation of permit units that represents a partial right to take action to protect their property. The initial allocation would be proportional to the size of the property, as measured (for example)

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<sup>33</sup> Field BC and Conrad JM, “Economic Issues in Programs of Transferable Development Rights” (1975) 51 Land Econ. 331.

<sup>34</sup> Collective property ownership forms such as condominiums would be treated as a single entity for purposes of the permits.

in feet fronting the shoreline. The initial allocation would in no case be sufficient to undertake protective shoreline alterations.<sup>35</sup>

- *The price (in permit units) for permission to act will be proportional to the adverse environmental effects of the action taken.* Low impact actions such as sand dune restoration will require the fewest permit units, while hard armoring with seawalls will require the most.
- *The price in permit units shall be expressed as a multiple of the initial allocation.* The cost of taking action to protect property would be expressed by a multiple over the initial allocation. Thus a low impact action might have a price of 10% more than the initial allocation while a high impact allocation might have a price of 100% more than the initial allocations (the multiples may be adjusted for different regions depending on environmental resources at issue in specific areas.) The use of multiples relative to initial allocations also automatically adjusts for property size.
- *Permit Unit Sales.* Holders of permit units are free to buy or sell them at whatever price is mutually agreeable.
- *Permit Units are nontaxable assets of the property.* Upon sale of a property, whatever permit units are associated with the property are transferred with the sale. The price of the units shall be included in the price of the property at mutually agreeable terms. However, the value of the permit units would be exempt from *ad valorem* real or personal property taxes and sales taxes, and income from the sales of permit units shall not be taxable under the California income tax in order to prevent tax policy from distorting the functioning of the shoreline protection permit markets.
- *Property owners may sell all their permit units.* Property owners may sell any or all of their initial allocation. Property owners who own no permits units will still be required to obtain the requisite number of permit units should they choose to take shoreline alterations to protect their property.
- *Emergency Responses.* Current law allows property owners faced with imminent threats of flooding to implement protection measures without extensive permitting. These provisions would be retained with the permit unit trading system. In emergency conditions, permission would be automatically available for taking temporary measures to protect property and lives, but all of the property owner's permit units would be held in escrow until the temporary measures are removed. Such measures could not include permanent hard armoring and any steps taken to convert a

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<sup>35</sup> See the discussion below re the application of the "existing"/"new" property criterion under section 30235 of the Coastal Act.

temporary solution to a permanent one would require the appropriate number of permit units.

- *A Permit Bank will be established to be the keeper of records, to be a market maker, and may trade permit units on its own account to provide funding for shoreline management or restoration actions of regional significance. The Bank would be an entity established in legislation, which serves as both the administrator of the system and as an important part of the market itself. The Bank serves as a central recorder of all transactions (including providing information to County records).*
- *An Environmental Agency will be designated with responsibility for establishing environmental protection and restoration goals in each region, for monitoring the attainment of these goals, and to make (or recommend) changes in the program if needed. The Environmental Agency is separate from the Bank. It will be responsible, together with the Bank, for designating the trading regions.<sup>36</sup> The Environmental Agency will conduct programmatic environmental impact reviews under the California Environmental Quality Act when the trading regions are designated. We do not propose a specific agency to serve this role.*

To illustrate the operations of the permit unit system, consider a simple description of environmental effects of shoreline protection based on three classes of action. Class 1 has the least impact (for example, dune restoration). Class 2 is a hybrid approach that is nature based, but also contains elements of armoring, for example beach nourishment with a groin to retain sand. Class 3 is a steel wall armored shore. In this example, the required numbers of permit units relative to the base allocation are set at:

- Class 1: 1.2 (20% higher than initial allocation)
- Class 2: 1.4 (40% higher than initial allocation)
- Class 3: 2.0 (100% higher than initial allocation)

For administrative simplicity, assume that the allocation of permit units corresponds to a “shore front unit”, which is calculated, for example, as property front feet/n (where n=10 for illustrative purposes). In this example, the allocation is set to 1 permit unit per shore front unit. To illustrate the trading process, consider a hypothetical beach where there are four small beach houses, each with 50 front feet on the beach; one large beach house with 100 front feet, and a

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<sup>36</sup> As noted above, the geographies associated with LCPs are rarely – if ever – related to environmental context, nor are they generally large enough to support the landscape diversity needed to support this system. Accordingly, our proposal envisions trading regions that are not confined to LCP regions, but the policies established by LCPs falling within the trading region may inform the marketplace parameters within a given regional marketplace. This will be explored in greater detail in the next phase of this project.

condominium or hotel with 250 front feet. Based on the assumption of 1 permit unit per 10 front feet, the small houses have 5 permit units each, the large house has 10 permit units, and the condo/hotel has 25 permit units.

Using the “permit costs” identified above, assume that the three small houses decide to restore some dunes on their stretch of the beach, which would protect all three properties. The permit requirement for this project would be for 20% above initial allocation, which would be 18 permit units, or a needed increment to be purchased by the homeowners of 3 units. There is a supply of permit units from other properties on the beach to provide multiple opportunities for trades.

At the opposite end, the condo/motel chooses to build a seawall. This will require twice the initial allocation of permit units, or 25 additional units. For the owners of the condo/motel, they could buy the permit units from the other property owners on the beach, from other properties in the trading region, or from the Bank.

If the neighbors sold their permit units to the condo/motel, they would then have the option of using the funds from the sale to purchase the permits to construct dunes, which would require 30 permit units, or they might decide to nourish the beach (which would require 35 permits in this example). By negotiating an appropriate price with the condo/hotel owners, the house owners could acquire all or a substantial portion of the costs of implementing a less environmentally damaging solution. The result is a beach that does have a sea wall on it, but it is also primarily protected with less damaging approaches.

Table A summarizes the relationship between the proposed prototype permit system and the objectives of regulating shoreline armoring, based on the Coastal Act and experience with tradable permits:

<b>Objective</b>	<b>Prototype Feature</b>
Allow coastal property owners to protect their property from flooding.	Owners can purchase permit units to secure protection, and can select the protection strategy they feel is most appropriate.
Minimize damage to natural shoreline features and processes from protection choices.	Protection strategies must be paid for in relationship to environmental damages.
Maximize the protection and restoration of environmental resources and processes.	The system creates incentives for lower damage choices, better planning for nature based alternatives, and resources from Bank sales of permit units for financing restoration projects.
Property owners must remain the key decision makers, but the permitting system should encourage them to consider the full range of protection choices before deciding which to implement.	Hard armoring will cease being the "default" choice when owners have transparent information on the comparative costs of protection options.

Objective	Prototype Feature
The permitting system should present the property owner with costs for the acquisition of permits that are related to the environmental effects of the protection strategy.	The number of permit units required to receive a permit increases as the environmental damage of the chosen alternative increases.
The initial allocation of permit rights should be perceived as fair in order to increase acceptance and confidence.	Initial allocation of permit units will be proportional to property size but will not be enough to take any shoreline altering action.
The permitting system should encourage individual property owners to work together to use protection choices that provide benefits to the shoreline and environment beyond the boundaries of the properties involved.	Property owners can share the costs of acquiring needed permits leading to cooperative strategies affecting larger areas.
The permitting system should be based on principles of fair exchange, including the exchange between willing buyers and willing sellers, each having access to relevant information and able to agree on a price reflecting each participants' valuation of the transaction.	Permit units are traded between willing sellers and willing buyers in a competitive market. One of the Bank's functions is to assure competitive and liquid markets. Permit units and unit sales will be exempt from California taxation.
Markets should be competitive, and transaction costs, including search costs, should not be so high as to distort prices.	The Bank will have responsibility for administering sales transactions and may set up exchange programs (for example online auctions) for permit units.
The market should not be subject to distortion through the acquisition of market power which restricts supply and drives permit prices up.	The size of trading regions and the responsibility of the Bank to hold a reserve supply of permit units limits market power.
Regions within which permits are traded will be defined so as to reflect environmental conditions and shall be of sufficient size to assure a functioning market for trading. The definitions of regions should be adjustable as sea level rise alters environmental conditions.	Trading regions will be selected based on balancing ecological characteristics and sufficient market size. The designation of trading regions will be subject to environmental review.

**Table A Comparison of Prototype Features with Policy Objectives**

The economic dimensions of shoreline armoring have been recognized in recent actions by the Coastal Commission to charge impact fees to those choosing sea walls. Impact fees are designed to recover some of the known external costs of armoring and serve some of the same incentive purposes as the pricing in the tradable permits approach. But impact fees are administratively determined and will reflect only the environmental factors. Determining the prices for permit units in market transactions incorporates not only the environmental damage, but also

the relative costs of different protection options as well as the values of the properties and economic circumstances of the property owners. Determining impact fees would also be part of the same costly regulatory process as present and so property owners would pay the permit process costs, impact fees, plus the costs of implementation. This is an approach that will come under considerable stress with sea level rise. With the tradable permits approach the property owner faces only the cost of the permit units and construction costs.

## **Moving forward**

The foregoing analysis shows that a proposed approach to meeting the Coastal Act's goals through a tradable permit system for shoreline protection is feasible, but it still requires substantial additional development to address a number of legal, technical and institutional issues.

## **Legal Issues**

A steady theme with tradable permit systems has been whether changing existing expectations with respect to a property through a regulatory process may constitute a taking under the Constitution.<sup>37</sup> Under the Supreme Court's decision in *Lucas v. South Carolina Coastal Council*, a taking will occur if a regulation "denies all economically beneficial or productive use of land."<sup>38</sup> This system would clearly not eliminate all beneficial use of any parcel, although it could change – either increase or decrease – the value of the parcel. For some parcels the proposed system would convert what could be interpreted as a complete right to armor into a fractional permit, thus – arguably – reducing the value of the parcel associated with the original right. In other cases, the proposed system may allocate a fractional permit where no right previously existed, thus increasing the value of the parcel overall. Over time, depending on the property owners' use of the fractional permits, any given parcel could flood or erode to such an extent that the economically beneficial use of the land was eliminated. However, the occurrence creating this condition would not be a regulation, but instead a force of nature and the combined with the property owner's choices about how to respond to this force.

The present proposal does not distinguish between pre-Coastal Act development and more recent development for the purposes of assigning initial permit unit allocations. Although this system would seem to create a fractional entitlement to armor on the part of many property owners that previously did not have such an interest, the legal and practical implications of this are unclear. As discussed above, the Coastal Act policy on seawall permit eligibility has been

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<sup>37</sup> Littlewood WH, "Transferable Development Rights, TRPA, and Takings: The Role of TDR's in the Constitutional Takings Analysis" (1998) 30 McGeorge Law Rev. 201; Bruening AD, "TDR Siren Song: The Problems with Transferable Development Rights Programs and How to Fix Them, The" (2007) 23 J. L. Use Environ. Law.

<sup>38</sup> *Lucas v. S.C. Coastal Council*, 505 U.S. 1003, 1015 (1992).

variably interpreted, and the availability of emergency exemptions for predictable conditions has added complexity to the existing legal foundations.

It may be that efficient and effective functioning of a tradable permit system may require extending partial rights to armor to properties not currently eligible under this section of the Act, but this is an issue that requires detailed property-level analysis to determine the extent of need for such rights. Moreover, as the differential treatment of “existing” and “new” properties for purposes of armoring is a function of language in the Coastal Act, it may be necessary to clarify this distinction, especially since the concepts of “existing” and “new” will themselves change as shoreline is altered by sea level rise.

### **Geographic and Operational Details**

There is significant diversity in shoreline types and development patterns along the California coast, from the highly urbanized areas south of Santa Barbara to pockets of intense development such as Pismo Beach and Monterey in the Central Coast to the remote shores of northern California. The regional basis for the tradable permit system will require detailed consideration of the different land forms and erosion threats in order to define the appropriate boundaries for the regions. Furthermore, we have also chosen to assess the feasibility of this approach in the context of Coastal Act jurisdiction and have not addressed the jurisdiction of the Bay Conservation and Development Commission (BCDC) in the San Francisco Bay region, which will require a separate investigation.

The boundaries of the trading regions should be constrained by the natural process of shoreline evolution (i.e., littoral cells)<sup>39</sup>, but they must also be large enough to comprise a competitive, efficient market. Although most local planning for shoreline management is done under the auspices of LCPs, LCP regions are unlikely to be large enough to meet these criteria. A more likely scenario is that a trading region would encompass multiple LCP regions, and the marketplace would – accordingly – need to reflect a diversity of local policies.

It is not clear whether ports and harbors should be included in a permit trading system and, if so, how. The problems of shoreline protection are very different for these areas than for residential or other commercial development because they are for the most part already heavily engineered. There are also potentially important differences between smaller ports primarily housing recreational and fishing boats, large mega-ports handling large volumes of cargo, and bulk ports specializing in petroleum or scrap metal.

The basic principles of the tradable permit system are outlined above, but there are a number of operational details to be determined, including the total

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<sup>39</sup> Pasch K and Griggs G, “Littoral Cells, Sand Budgets, and Beaches: Understanding California’s Shoreline” (Santa Cruz, CA, 2006)

volume of permits, initial allocation rules, permit units required to take various shore protection actions, and how long permissions granted by permits will be effective. This will include defining the “classes” of permits that will distinguish between nature based approaches and hard armoring approaches on which permit requirements will be based. Many of these decisions will have to be made after analysis of the above issues.

Establishing the initial conditions of the market in the form of permit allocations has been shown to be perhaps the single most important factor in the successful launch of a tradable permit system.<sup>40</sup> It has also been shown that equity considerations are a critical factor in public acceptance of market approaches. Mackenzie et al. This prototype creates an initial allocation of permits that is proportional to linear shore frontage. Allocation based on total area is also possible and may be preferred in some situations. Multiple allocation schemes should be evaluated to determine which will be both effective at achieving the above-referenced goals, and also perceived to be the most equitable.

Another operational question to be considered is: who should participate in tradable permits market? Shoreline property owners are the obvious participants, but the largest property owner on the California coast is the State of California through myriad agencies including. Caltrans, State Parks, the Division of Boating and Waterways, and others. Plausible arguments can be made to include some state agencies, like State Parks, but not others (Caltrans). If State agencies are included, it is not clear whether their participation in the permit market should be subject to any special conditions. Similar issues exist with shorefront property owned by local governments.

Other parties, such as conservation groups, may want to enter the market by acquiring permit units that could be sold at discounted prices to owners wanting to undertake particularly important environmentally protective actions. Rules will need to be established about if and how such non-property owners can participate in permit unit markets.

### **Institutional Formation: The Bank and The Environmental Agency**

The Bank is a key to the success of the permit unit market. We envision the Bank as the administrator of trades, but also as able to trade on its own account (with an initial allocation of permit units) in order to both ensure the liquidity of the marketplace, and – potentially through the use of its own trading earnings– to support protection projects of regional significance that may not have otherwise have adequate funding.

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<sup>40</sup> Mackenzie I a., Hanley N and Kornienko T, “The Optimal Initial Allocation of Pollution Permits: A Relative Performance Approach” (2008) 39 Environ. Resour. Econ. 265; Armstrong CW, “Using History Dependence to Design a Dynamic Tradeable Quota System under Market Imperfections” (2008) 39 Environ. Resour. Econ. 447.



A critical success factor for tradable permits is preventing the acquisition of market power that would distort the functioning of the markets.<sup>41</sup> Market power distortions occur when a single (monopoly) or a few (oligopoly) users acquire a sufficient volume of tradable permissions that they can manipulate prices. Such manipulation can include withholding permits or trades from the market to increase the price artificially. Defense against market power is one of the key functions of the Bank, which must be charged with using its stock of permit units to make sure that the market is liquid at all times (that is, there needs to be an assurance to buyers that the Bank is always available to sell them units at some benchmark price). The Bank will have to manage conflicting goals of assuring competitive markets (which may push permit unit prices down) at a time when as a trader it would prefer higher prices. To be seen as a fair player, it will have to adopt policies that provide significantly more transparency to its actions than would a normal market participant.

The Environmental Agency has two principal functions. The first is to define the regions within which trades will take place to ensure environmental compliance of the program on a regional scale consistent with the overall purpose of the Coastal Act. Regions must have a level of ecological coherence, probably based on the concept of littoral cells. The process of delineating the trading regions offers the opportunity to apply the California Environmental Quality Act through programmatic environmental impact review (EIR).

The Environmental Agency's other principal function is continual monitoring to make sure that permit conditions are adhered to and enforced. The Environmental Agency must also monitor overall environmental and shoreline conditions in each trading region and be prepared to recommend changes in the relative prices of armored and natural infrastructure depending on evolving conditions given sea level rise, retreat from the shore, and evolving shoreline forms and erosion patterns.

At this point we do not propose a specific agency to perform the functions of the Environmental Agency. The Coastal Commission is clearly a candidate to perform these functions, but we leave open the option of whether the Commission or another existing agency or an entirely new agency would be appropriate.

## **Conclusions**

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<sup>41</sup> Liski M and Montero JP, "A Note on Market Power in an Emission Permits Market with Banking" (2005) 31 *Environ. Resour. Econ.* 159; Sartzetakis ES, "Tradeable Emission Permits Regulations in the Presence of Imperfectly Competitive Product Markets: Welfare Implications" (1997) 9 *Environ. Resour. Econ.* 65, <http://www.springerlink.com/content/1517t78472207744/>; Field and Conrad.

The California Coastal Act endeavors to balance the competing pressures on the state's lengthy but fragile shoreline. It recognizes the needs of property owners exposed to flooding to take steps to prevent damages but also that such steps can be damaging to other values protected by the Act and seeks to limit those damages. Whether the decisions of the Coastal Commission have resulted in an appropriate balance over the past forty years may be debated, but it is clear that the next forty years will present the Commission with challenges to its responsibility for maintaining California's shores that were never envisioned when the Act was passed. Under even the most optimistic scenarios, within decades much of the shoreline on which Californians have built billions of dollars of structures will not exist in the same place it is today. The risks of even greater change are becoming apparent as we learn more about the potentially catastrophic consequences of rapid ice sheet collapse.<sup>42</sup>

This proposal for a tradable permit unit system to replace the Coastal Act's existing permitting system for protecting properties would represent a very dramatic change in the way that the Coastal Act's goals are implemented. We recognize that the proposal requires significant elaboration both on technical issues and with the affected communities (private and public property owners, local and state agencies, the real estate community, and nongovernmental organizations). Tradeable permit approaches have been shown to provide the flexibility and efficiencies that will be needed and should be further assessed for California's shoreline management. The Coastal Act continues to set the destination towards which management of California's shores should be directed, but the course will have to be very different than that in the past.

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<sup>42</sup> Hansen J, Sato M, Hearty P, Ruedy R, Kelley M, Masson-Delmotte V, Russell G, Tselioudis G, Cao J, Rignot E, Velicogna I, Kandiano E, von Schuckmann K, Kharecha P, Legrande a. N, Bauer M and Lo K-W, "Ice Melt, Sea Level Rise and Superstorms: Evidence from Paleoclimate Data, Climate Modeling, and Modern Observations That 2 °C Global Warming Is Highly Dangerous" (2015) 15 Atmos. Chem. Phys. Discuss. 20059, <http://www.atmos-chem-phys-discuss.net/15/20059/2015/>.