Introduction

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The Lagoon of Venice is a unique wildlife habitat and recreational site, and has been a World Heritage site since 1987. Its fisheries have provided sustenance to generations of residents of the city of Venice and of the surrounding region.

To the founders of Venice, the Lagoon had a special strategic significance, and the Republic of Venice – the Serenissima – was well aware of the importance of preserving and managing this natural resource carefully. In an effort to protect the fish stocks, for example, laws were passed that prohibited harvesting fish smaller than a certain size. Rivers were diverted to reduce sedimentation and regulate the depth of the Lagoon waters. As a result, the Lagoon's shallow waters protected the Republic of Venice from its enemies for one thousand years, making the city inaccessible from the sea and the mainland.

The Lagoon of Venice is a complex system where ecological and socioeconomic dimensions have co-evolved over time: the delicate and complicated interrelationships between water quality and movement, coastline, flora, fauna, and human health and wealth constitute an interrelated whole where any modification or disruption tends to affect many and diverse components of the ecological system, settlements and groups of people.

Clearly, the Lagoon has experienced a variety of natural and anthropic stimuli over the centuries. In recent decades, these stimuli have included agricultural pesticides and fertilizers runoff, hazardous wastes leachate and contaminated sediments from the chemical complex at Marghera and the industrial developments of the areas bordering on the Lagoon. 'High water' events and erosion from the wave motion created by boat traffic and by the digging of the *bocche di porto* (harbour access) to allow the growth of the industrial and tourist harbours have resulted in a serious deterioration of the ecological balance of wetlands and marshes, of the morphology and landscape of the Lagoon and its islands, and have caused damage to historical buildings and property in the city of Venice. Exotic species were introduced that compete with native species for habitat, and aggressive harvesting

techniques were adopted in commercial fishing that wiped out native stocks and caused significant environmental damage.

The restoration of the historical centre of Venice has been a key political issue at the local, national and international level in the past century, and in the last decades increasing attention has been paid to the Lagoon. Public policies are under consideration that would restore environmental quality, fish stocks and habitat, and defend the morphology and landscape through the strict control of fishing practices, the restoration of island coastlines and marshes, and the protection of the islands from high tides. These policies therefore include a mix of (i) public works, such as the construction of floodgates, beach nourishment programmes, and containment of the hazardous wastes at the Marghera industrial site; (ii) regulation, such as restrictions on fishing equipment, sites and boat speed and access; (iii) urban regeneration programmes, zoning and remediation of the contaminated sites, and (iv) reliance on economic incentives, such as subsidies and others. Some funding for (iv) is available through European Union programmes.

In addition to pursuing environmental quality goals, these policies seek to promote economic growth. Economists would recommend that in examining such policies, at least some consideration be given to their costs and benefits. This means that the losses and gains brought by the policies must be monetized, and compared with one another.

In a typical cost–benefit analysis, the costs are comprised of both direct and indirect cost of investments and regulations. They therefore include the resources that are used up for construction or for private parties to comply with the regulations, monitoring and enforcement costs on the part of the relevant authority, welfare losses for consumer and producers associated with changes in price and quantities of goods traded on regular markets (such as fish and shellfish harvested in the Lagoon), transitional costs (e.g., unemployment) and any other adverse effects the policy may have on product quality, factor productivity, innovation, discouraged investment, and changes in markets indirectly affected by the policy. Ideally, much of the information necessary to compute the costs of the policy comes directly from the affected markets.

The benefits of these policies include, among others, the monetized value of the effects on human health, increased biodiversity, protection of landscape, and improved recreational opportunities for recreational anglers, boaters, swimmers, and the parties affected by the new economic opportunities created by the policies in many sectors. These benefits are experienced by the residents of the Lagoon area and by the relevant categories of users. In addition, it is likely that improving environmental quality, and protecting wildlife and landscape in the Lagoon will improve the well-being of many people that do not currently visit the Lagoon nor plan to

in the future. The latter category of benefits is generally termed ‘non-use values’.

To estimate the monetary value of benefits, it is necessary to find out how much people are willing to pay for them. It is, however, generally difficult to place a monetary value on benefits to recreationists and non-users, because these benefits are not bought and sold in regular markets. To circumvent this problem, it is possible to deploy non-market valuation methods. The travel cost method and contingent valuation are examples of such approaches. The former uses actual visits to a resource, and the cost of travelling to and spending time at this resource, to estimate a demand function, from which it is possible to compute an individual’s willingness to pay for access to the resource and for improving its (environmental) quality.

Contingent valuation is an example of a survey-based, stated-preference method, which relies on what people say that they would do under well-defined but hypothetical circumstances. We wish to emphasize that non-market valuation methods are appropriate for placing a value on marginal changes in the level or quality of an environmental resource, and should not be construed as being able to provide the value of the resource *per se*.

This volume begins with three chapters that survey three important non-market valuation methods. In Chapter 1, Alberini and Longo describe the conceptual underpinnings of contingent valuation, and discuss practical considerations that researchers must face when conducting one such study. In Chapter 2, Defrancesco and Rosato briefly present the travel cost method, focusing on the role played by annual fixed costs (boat maintenance, license and equipment) when the evaluations are used for long term policy setting. In Chapter 3, Defrancesco et al. present a review of the use of appraisal methods in estimating the economic value of environmental resources. These techniques can be applied to computing both costs and benefits of environmental policies or the damage to natural resources caused by polluting events. Defrancesco et al. are very careful in highlighting the advantages and disadvantages of these approaches, and the fact that they necessarily rely on information from the markets. Absent markets for the harvests from the natural resource, or for goods whose quality is affected by the natural resource (e.g., homes in polluted neighbourhoods), it is necessary to resort to techniques based on directly questioning people about the value they place on a change in the resource.

Chapters 4 and 5 provide applications of these methods. In Chapter 4, Alberini et al. describe a contingent valuation study where residents of the Veneto Region were asked to report information about their willingness to pay for improvements in the environmental quality and resource management at and around S. Erasmo, one of the largest – and lesser known – islands in the Lagoon of Venice. The sample of respondents contained both users of the

island – people who visit S. Erasmo for recreational purposes – and non-users, and Alberini et al. identify the use and non-use components of value for these environmental improvements. In Chapter 5, Rosato et al. present a model for the evaluation of environmental and urban improvements on the islands of the Lagoon of Venice that predicts the changes in residential real estate values using a mixed hedonic–hierarchical value function integrated with a Geographical Information System database that provides spatial distributions of changes in value.

As mentioned, the Lagoon of Venice has important fishing grounds, and both commercial and recreational fishing activities have taken place in them for centuries. In Chapter 6, Nunes et al. apply a stated-preference technique known as conjoint choice experiments for the economic valuation of alternative clam management practices in the Lagoon. They assess the preferences of commercial fishermen for various policies and restrictions on high-impact fishing techniques.

Commercial fishermen sometimes compete with recreational anglers for fishing stocks, and any Lagoon fish and fishing management policies that regulate the former will necessarily have an impact on the latter. In Chapter 7, Zanatta et al. use the travel cost method to estimate the welfare change implications for sports anglers of an improvement in catch rates brought about by controlling illegal clam fishing in the Lagoon. They combine information about actual trips at the current price per trip faced by anglers with intended trips for different, hypothetical prices and catch rates.

The state of conservation of the Lagoon of Venice is necessarily affected by the industrial activities taking place on the waterfront, and by the heritage of industrial activity and waste disposal practice that took place in the past. Sustainable development policies must, therefore, address the issue of cleaning up these sites while encouraging the productive reuse of these areas.

Clearly, land developers and investors are key players, and any cleanup and redevelopment has the potential to affect the value of the (formerly contaminated) land. In turn, any potential appreciation influences the attractiveness of contaminated sites to developers. Since the attractiveness of a parcel of land should be captured into its price, how can we find out how contamination, and subsequent remediation, affects the value of land? In Chapter 8, Tonin offers a survey of approaches for valuing contamination and for establishing the effect of contamination, and remediation, on real estate property. She concludes that the evidence of the effect of contamination and cleanup on the value of real estate is mixed, and that techniques that rely on observing market transactions on contaminated property vis-à-vis pristine property cannot be applied at Marghera, where property sales are few and far between.

Because of the limited number of transactions for the industrial area in Marghera, and the need to assess the attractiveness of its parcels – before and after remediation – to an international and domestic market, in Chapter 9 Alberini et al. resort to a survey of developers, deploying stated-preference questions to determine which policies – liability relief, fast-track review of cleanup plants, or financial incentives – can be used and which will be the most effective in stimulating productive reuse of these properties. This chapter, therefore, focuses on tradeoffs between economic incentives such as subsidies and imposing or relaxing liability, an economic tool that forces polluters to internalize the damages of pollution, and regulation, and tries to assess which is more effective in attaining remediation and redevelopment of contaminated sites.

Were these economic incentives and regulatory frameworks applied to the Marghera industrial area context, would they actually work? In Chapter 10, Trombetta and Turvani describe the legal and institutional context for remediation of contaminated sites in the Marghera industrial area, and discuss the promise of new policies based on voluntary agreements, which may be able to speed up and steer redevelopment.

We hope that this book offers useful guidance to those persons who are involved in studying or examining policy options for complex natural resource systems. The Lagoon of Venice is certainly one of the best possible case studies.

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