Coastin

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Editorial

Policies and perceptions influence uses of coastal resources. Policies provide the signals that affect choices and perceptions. In the context of coastal areas, policy influences the location of economic units, the input and output mix, and the technological choices involved in the production process. In a globalized world, policies can affect the coastal environment both positively and negatively. Positive effects can be through changes in relative prices, which may result in more efficient use of coastal resources; privatization and reduced state interference in individual decisions, which will encourage management to improve operating performance and production efficiency; foreign direct investment and international cooperation, which can bring in clean technologies and best practices from outside, assuming that the country provides a strong clean development message to those wishing to invest. The negative impacts of policy in a globalized world can be accelerating coastal land conversion and degradation; accelerating in-migration, greatly increasing coastal population densities and resulting in urban sprawl; and the absence of price signals, which can result in coastal degradation as industry uses up 'free' environmental resources in place of capital investments. Environmental policies are important to create the right incentives to influence environmental behaviour. Policies can therefore be powerful agents or regulators of change.

Coastin encourages articles that relate to coastal resources policy. In this issue we carry an article on policies relating to groundwater use in the European Union. This is especially relevant to developing countries where there is often no policy relating to groundwater use. We would welcome contributions from other developed and developing regions on this topic, so that information is available to a wider audience.

Another agent of change to coastal ecosystems can be perceptions of local communities that relate to the value and use of these ecosystems. Perceptions can change over time and can be important indicators of the direction of change. Policies can also affect perceptions relating to coastal change. Here we carry an article on research done on perceptions of villagers with regard to coastal ecosystems in villages of a tourist state of India. Again, we encourage our readers to contribute articles on this subject.

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Updates on the project

The project 'Measuring, monitoring, and managing sustainability: the coastal dimension' entered its second phase with the identification of the districts that best represent the drivers that have an impact on the coastal resources of India—Thane for industrial activity, East Godavari for agriculture/aquaculture, and North Goa for tourism.

Specific study sites chosen include 12 villages in Bardez *taluka* in North Goa; Kajuluru and Tallarevu *mandals* in East Godavari; and parts of Thane, Kalyan, and Ulhasnagar *talukas* in Thane District.

All the project partners worked individually as well as together towards the fulfilment of project objectives. The work includes

- visits to the three study sites and data collection and analysis by different teams
- questionnaire formulation and pilot survey for socio-economic analysis
- interviews with aquaculture experts and other stakeholders of aquaculture.

The preparation of village-level database and the socio-economic analysis of secondary data for all three study sites are in progress.

An integrated methodology of biophysical and socio-economic dimensions to understand land-use change processes in coastal areas

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The study of land-use changes (in coastal or non-coastal areas) is an essential contributing factor to the understanding of global change. While the problems caused by these changes are diverse, all of them can put the sustainable development of a region at risk. In developing countries that have high population growth rates, land has competing uses: while it is necessary to increase and intensify agricultural production, the demand for land to meet urban and industrial needs increases, causing serious problems in terms of arboreal vegetation and soil degradation (by erosion and pollution). In industrialized countries (particularly in Europe) that have low population growth rates, the problems resulting from land-use change have a different nature. Under the Common Agricultural Policy adopted by the European Union, agricultural areas tend to decrease, but this is accompanied by the expansion of land-use stimulated by urban growth and tourism activities. In certain regions, such expansion has taken place rapidly and, as it was not preceded by thorough territorial planning, it has contributed to the degradation of natural resources and the landscape itself. It is thus important to measure, monitor, and manage land-use changes in such a way that land-use is balanced and has minimum negative impacts.

The fundamental objective of the study 'Land-use change: a methodological approach to understanding the nature/society interactions in coastal areas'[1] (1999), was the development of an integrated methodology for analysing land-use changes in coastal areas. This methodology focuses on understanding land-use changes and the influence of the various agents of change present in the region, whether of a biophysical (climate, soil, land forms, vegetation), socio-economic, or institutional nature.

Figure 1 illustrates the methodology developed in this study, outlining the theoretical framework of integration of biophysical and socio-economic data at different levels of analysis. It also shows the various phases of operationalization of the research. In the initial phase, the patterns of land-cover changes and the socio-economic dynamics are identified at the regional level, which in the case of this study is the Alentejo coastal band. The integrated study of biophysical and socio-economic data conducted at various levels of

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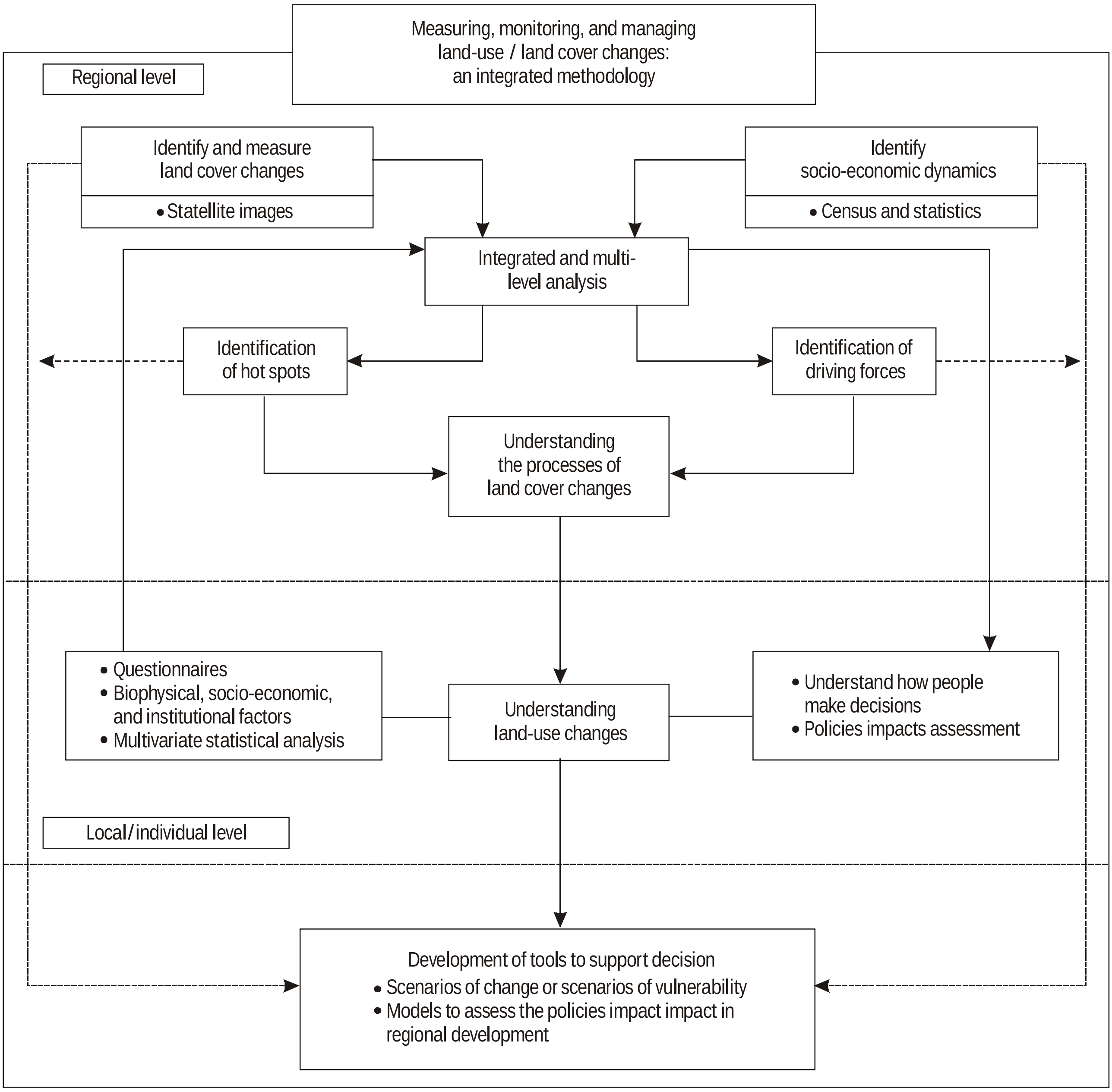

Figure 1 Schematic representation of the integrated methodology

spatial analysis was developed using GIS (geographic information system) tools. In this phase of regional analysis, this type of integrated analysis permitted the identification of the main driving forces and hot spots,[2] thus contributing to the understanding of the processes of land-cover change.

Nevertheless, land-use changes can only be understood in depth through the understanding of the decision-making processes of the various agents of change present in a given territory. Thus, the next level of analysis unfolds at the local or individual level and attempts to find out how people make decisions.

As stated earlier, the relation between land cover and land-use and the socio-economic data is rarely direct. Nevertheless, any methodology of study of land-use changes has to club together such data as it enables a first reading supported by the processes of change at a given regional scale. The social aspect of the GIS, however, is only fully developed with the creation of a local-level analysis, where it may serve as a support for structuring enquiries regarding agents of change, thereby putting forward more detailed and documented explanations of land-use changes.

[2] Hot spots are defined as areas where the greatest land-use changes are observed or where their occurrence is predictable.

It is in the phase of local/individual analysis that we may understand the way in which people adapt their land-use strategies to the biophysical and the institutional frameworks, thus contributing to the measurement of the real impact of national or European planning policies and ordinance.

This methodology is useful to the various agents of change in that it contributes to the construction of tools to support the decision-making process. Thus, in a regional context such as in the EU, where strong pressures that lead to accelerated changes that demand adequate and equally rapid answers are registered, the need for such a tool that supports decision-making processes at the national, regional, local, and even individual level is indeed great.

The usefulness of this methodology lies in the construction of scenarios of change or vulnerability by attempting to identify the critical areas of land-use change (present or future) and understanding and evaluating the vulnerabilities of those areas relative to those changes. In addition, it helps construct models for the evaluation of the impacts of national and supranational policies, thereby contributing to the evaluation of the real effects of these policies on land-use change and on the sustainable development of a region.

On legislation and concepts concerning geographical zoning for groundwater protection

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This paper addresses the (1) legislation on methods of groundwater geographical protection zoning from select EU (European Union) member states and the USA and (2) contribution for the revision of Portuguese legislation on groundwater geographical protection zoning.

Groundwater aquifers represent a strategic resource whose management and protection, from both the quantitative and the qualitative points of view, should be appropriately considered at national and local authorities levels.

The development of a groundwater protection programme in the context of the latest land-use control policies has the objective of avoiding problems concerning groundwater pollution. It makes possible the achievement of two fundamental goals: ensuring the availability of a high-quality water supply source and saving large amounts of financial resources (which can then be used in other areas of public utility), by avoiding the need for groundwater rehabilitation.

In the framework of the EU, most of the member states have specific legislation that establishes protection zones around wells, defining the polluting activities that should be banned in each zone, and whose main objective is the preservation of groundwater quality. However, the application of such legislation is difficult.

In Portugal, recent legislation (DL 84/90, 86/90, and 90/90 of 16 March 1990; DL 45/94 and 46/94 of 22 February 1994; and DL 236/98, monitoring the quality of groundwater resources) has reiterated the importance of defining protection zones as an instrument of groundwater protection. The new Portuguese Legislation of Groundwater Protection, DL 382/99, of September 1999, replaced Norma Portuguesa Definitiva NP836, established in 1971. The NP836 defined two zones, 'near protection zone' and 'far protection zone', with extensions depending on the aquifer type and on its filtration capacity. In this norm, the size of protection zones was defined in a simplified way. Moreover, its application was not complete all over the country. The new legislation considers three protection zones, including a zone related to the concept of 50 days travel time. Ciabatti and Lobo-Ferreira (1994) had previously suggested the use of similar concepts in Portugal.

Groundwater geographical protection zoning criteria used in the EU and in USA

In most of the EU member states, legislation concerning the limitation of hazardous activities endangering groundwater was established in the early 1970s. Legislation concerning groundwater pumping systems protection was also set up.

According to Margat (1992), groundwater protection in the EU member states is provided by two kinds of measures.

1 General regulatory measures, often linked to environmental impact studies.
2 Defining two or three protection zones around groundwater pumping systems.

The second measure has been or is being established in most EU countries and has proved a success so far.

The horizontal distance criterion consists of defining a circular area around the well, with a radius value that is determined without taking into account the hydrogeological and hydrodynamic characteristics of the aquifer to be protected.

The horizontal travel time criterion is based on the definition of travel time of polluted particles in the aquifer flow field. This is more advantageous because it permits the definition of the residence time of contaminants in the aquifer and their arrival time at the pumping well, depending on the hydrogeological and hydrodynamic characteristics of the aquifer and the location of the pollutant source.

The problem of confined aquifer protection is not specifically addressed in any of the items of legislation analysed. Confined aquifer protection is achieved simply by applying the same methodologies used for unconfined aquifers, i.e. reducing the size of protection areas when a superficial impervious or semi-impervious layer is present. This approach is often combined with measures for avoiding the removal of the covering impervious layers protecting the underlying aquifer. No hydrogeological criterion is used to justify this very simplified approach.

The various items of legislation show great differences concerning the degree of specification of banned and/or controlled activities inside protection zones.

The zoning approach considers the following three zones around pumping wells.

1 An operational courtyard (zone I), immediately around the well, with the goal of protecting the well and its immediate environment from any kind of contamination.
2 An inner protection zone (zone II), which is related to the microbiological protection of abstracted waters and protection against contamination that would be hazardous a short distance from the well.
3 An outer protection zone (zone III), which is related to the protection of groundwater from pollutants that can affect water even from long distances or from chemicals which are not easily decomposed). Eventually, this zone could be divided into two sub-zones (IIIa and IIIb) for very large aquifers.

For the delimitation of zones II and IIIa, the travel time criterion must be considered most suitable. The horizontal distance criterion, in contrast, may cause inaccuracies in the definition of the size and shape of the protection areas. This is because, in the case of high

Table 1 Activities, processes, and installations not acceptable in well-head protection areas, according to German legislation

Zone	*Activities, processes, and installations*
Zone I	Vehicle and pedestrian traffic
	Agriculture
	Manure and pesticides
	(and all mentioned bans or restrictions of zones II, IIIa, and IIIb)
Zone II	Constructions, plants, and workshops
	Farms, stables, and sheds
	Building sites and stock of building material
	Roads and railway
	Transfer points and parking lots
	Sport facilities and camping sites
	Tenting and bathing establishments at surface waters
	Car washing and oil change
	Cemeteries
	Removal of surface layers
	Mining and quarries
	Intensive grazing
	Allotments
	Fuel storage and transport of water-endangering substances
	Waste water pipes
	Fishponds
	(and all mentioned bans or restrictions of zones IIIa and IIIb)
Zone IIIa	Commercial use of water-endangering substances
	Mass livestock
	Open storage and water-endangering pesticides
	Waste water treatment
	Hospitals, sanatoriums, and urbanization
	Storage of water-endangering substances
	Airports and associated facilities
	Military facilities and manoeuvres
	Waste sites
	Sewage treatment plants
	Injection of cooling water
	Essential removal of surface layers
	New cemeteries
	Shunting stations
	Road construction with water-endangering substances
	Drilling
	(and all mentioned bans or restrictions of zone IIIb)
Zone IIIb	Oil refineries and smelting works
	Chemical plants and nuclear reactors
	Waste water injection
	Deposition and underground storage of water-endangering substances
	Pipelines for water-endangering substances

regional hydraulic gradient, it may lead to an overestimation of sizes of protection zones downstream of the wells and an underestimation upstream. This would lead to a lower degree of protection and a higher implementation cost–benefit ratio.

The horizontal distance criterion is more suitable for the definition of zones I and III (or the eventual zone IIIb) for the following reasons.

Concerning zone I, the dynamic hydraulic head distribution in the vicinity of a pumping well is only slightly influenced by the regional hydraulic gradient.

Zone III (or zone IIIb) represents (following the approach to groundwater protection of the Federal Republic of Germany) a general protection area which ensures a sufficient degree of protection for all groundwater resources.

The definition of the 50 days isochron is considered reasonable for the delimitation of zone II. Nevertheless, it is important to consider that the area delimited by the 60 days isochron does not imply a much greater increase in land-use limitation and assures a higher degree of protection against pathogenic contamination.

For the delimitation of zone III it is better to define two kinds of approach to protection zoning.

1 For very large aquifers, a zone IIIa (the extent of which corresponds to the 1 year isochron) and a zone IIIb (the extent of which coincides with the recharge area of abstractions) may be defined.
2 For aquifers of limited extension, only a zone III might be defined, corresponding to the recharge area of abstractions.

The banned activities inside the protection zones may be identified with those listed in Table 1. This list is based on the Federal Republic of Germany legislation.

The implementation of a well-head protection programme is very difficult if not supported by measures for assuring a good level of compensation for whoever incurs extra costs, resulting from the imposition of the groundwater protection measures establishing an adequate fee or charge – policy specifically aimed at forcing consumers and anyone else endangering the groundwater quality to bear the cost of protection avoiding diluted responsibilities or conflicts between ministries, state, or local departments, state or local agencies, water and/or basin authorities, etc. in the implementation of such programmes assuring social support from local communities for groundwater and well-head protection programmes.

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Dune vegetation: need for a reappraisal

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Sand dunes and dune vegetation are not sufficiently appreciated in India and other developing countries. Considered as areas that are an obstacle to development, they are often razed to accommodate constructions. This is particularly so in tourist areas. However, these ecosystems have an important role to play as providers of services, which needs to be highlighted so as to promote their conservation.

Sand dunes play a vital role in protecting the coast from erosion and flooding. One of the important factors in dune stability is the cover provided by dune vegetation. Dune vegetation species on the west coast of India is observed to be almost double that of the east coast.

Sand dunes have been classified into pioneer zone, midshore zone, and the backshore zone (Desai 1995 and Untawale 1994). The pioneer zone is closest to the sea and the backshore zone is farthest. While the former is covered by herbaceous crawling plant species with the dominant flora of *Ipomoea pes-caprae* and *Spinifex littoreus*, trees such as *Casuarina equisetifolia* and *Cocos nucifera* mostly cover the latter. The middle zone has shrubs such as *Spinifex littoreus*, and *Spermacoce stricta*. The three zones together form a vegetation slope, which acts as a block to the movement of wind and sand (Desai 1995). Typical sand dune vegetation is given in Figure 1.

Sand dune vegetation plays an important role in the formation and stabilization of coastal sand dunes. Pioneer plants trap and hold wind-blown sand in the frontal dune and help create conditions that encourage the establishment and growth of other plant communities such as woodland, scrub heath, and forest. All plants, whether they are herbs, shrubs, or trees either growing singly or in groups, have a role in the development of vegetation cover and together they bring about stabilization (BPAQ 1981).

Wind-blown sand trapped in the frontal dune by vegetation serves as the reservoir of sand for the beach during periods of wave erosion. In the absence of sand-trapping dune vegetation, wind-blown sand from the beach move inland and is lost to the beach dune system. Wind erosion of the beach and unvegetated frontal dunes results in coastline recession. The parts of dune plants above the ground act as an obstruction, increase surface roughness, and cause reduction in the surface speed of sand-carrying wind. The reduction in the wind movement results in the deposition of sand around the plants. *Spinifex littoreus* is the most successful sand-trapping plant. It has the ability to grow through the accumulation of wind-blown sand. Cycles of sand deposition and plant growth results in dune formation.

The development of vegetation cover on newly formed dunes, if undisturbed, will create conditions that suit the colonization and growth of a wider range of plant species. The shade produced by plants keeps surface temperatures lower than that of bare sand and, together with reduced wind movement, helps to lower the evaporation rate from the sand surface. Increasing vegetation cover further reduces wind movement, which results in a lower rate of loss from plant leaves. Dead plant and leaf litter add humus to the sand (BPAQ 1981). Dune vegetation traps sands, thereby increasing the amount of sand in the dunes. Dune vegetation is adapted to the rigours of wind and waves. However, it is vulnerable to anthropogenic pressures of stamping feet, vehicles, and cattle.

Dune vegetation contains many species of specific flora (and fauna) and is thus an ecological storehouse rich in genetic diversity. According to experts, sand dune vegetation is not commonly used for economic gain, but there are some identified uses, which are given in Table 1. They also have a high ecological value (Untawale 1994). They bind sand particles, develop and stabilize sand dunes, check sand movement, produce humus, and increase soil water holding capacity.

Thus dunes and dune vegetation have a social value and need to be protected. Some of the preventive measures to protect sand dunes and their vegetation, as suggested by Chapman (1976) and Clark (1977), are given below.

1 Prohibit lowering of the dune crest to provide building site.
2 Restrict construction to areas behind the dune line.
3 Prohibit all construction on the dune.
4 Where construction is permitted or already exists, ensure replanting of devegetated area.
5 Provide technical assistance and a convenient source of beach grass plantings to property owners.
6 Prohibit all solid construction on the beach.

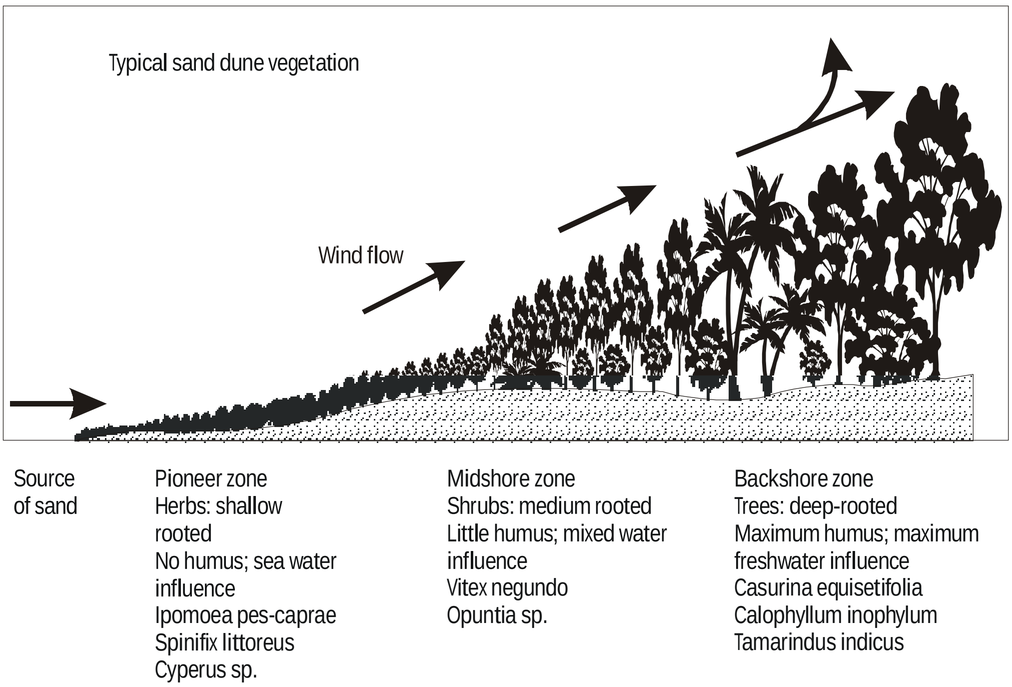

Figure 1 Typical sand dune vegetation

Table 1 Economic uses of sand dune plants

Name of the species	*Economic uses*
Ipomoea pes-caprae	Sand binder used as stomachic and diuretic. External application for rheumatism. Seed used for stomach ache and cramps.
Ageratum conyzoides	Used as nerve tonic. Decoction used in diarrhoea, dysentery, colic, and other gastro-intestinal ailments. Leaves yield an essential oil, which helps tobacco to flower.
Vitex negundo	Leaves used for tonic and vermifuge, smoked for relief in catarrh and headache. Leaves and roots possess tranquillising effects. Young shoots employed in basket-making.
Lactuca remotiflora	Used in chronic obstructions of liver and bowels.
Eragrostis unioloides	Used as cattle and horse feed and as green manure.
Digitaria adscendens	Used as fodder grass.
Canavalia gladiata	Green pods and beans used as vegetable.
Sesuvium portulacastrum	Leaves and stem eaten as vegetable.
Zornia diphylla	Used as cattle fodder, also grown as cover crop for green manure.
Casuarina equisetifolia	Used for fuel, house post. Bark used for dyeing and tanning, wind breakers, and pond binders.
Anacardium occidentale	Kernel eaten, cashew apple used for preparation of wine. Oil used as varnish, ink, insulation coating wood. Used for packing case and boat-building.

Source *The Useful Plants of India as* cited in Desai (1995), Table 7, p.57

7 If buildings are made, the groundwater level should not be allowed to reduce below a critical level; otherwise, stabilizing beach grass will be difficult and the dunes will be exposed to wind erosion and storm damage.

8 Access across the dunes should be restricted to stabilized pathways or roadways. All other routes should be blocked off.

9 Residential development should not prevent public access to the beach.

10 Public rights to way should be provided at frequent intervals.

11 Providing an artificial cover to the sand initially and then a closed vegetation proves successful.

12 Only plants that can tolerate the adverse conditions of the dunes should be tried for plantation.

13 Softwood trees that need less attention for growth and improve the soil with their litter are suggested for plantation.

14 The movement of the sand should be stopped as near the source as possible.

15 There should be no gullies or embayment on the dunes as irregularities on them affect wind velocity. Smooth and regular sea frontage lessens the chance of erosion.

16 The initial fences must be located in relation to the prevailing wind on which depends the movement of the sand.

17 If the land is sinking in relation to the sea level, erosion will be continuous. So artificial dunes have to be built from time to time.

18 If the sand is not too mobile, it can be stabilized by planting grass but if it is highly mobile, it can be stabilized by brush fences at right angles to the sand movement.

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Village perceptions of coastal ecosystems: findings of a study

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In 1999, TERI carried out a survey of 711 households to assess the community perceptions of three coastal ecosystems in five villages of Goa—four tourist and one non-tourist (TERI 2000). A questionnaire was developed using information about the ecosystems obtained from the literature, experts, and the locals. It was distributed among the villagers to obtain their perceptions regarding trends in three coastal ecosystems: sand dunes, *khazans*, and mangroves. The concern of the study was the people's perception about the use of ecosystems to themselves as well as to the community they belong to, and how the perceptions vary with demographic variables (age, gender, and education), stake in tourism, the distance from the ecosystem, and the type of tourist destination the respondent is located in. It also studied people's perception with respect to changes occurring to the ecosystem either in terms of reduced area or degradation, perception of the activities that may pose as threats to them, and the attitude to protection of these ecosystems. This article highlights some of the findings of the study.

Coastal ecosystems of interest

Mangroves

Mangroves are ecosystems that provide a number of benefits to the community, some of which are marketed, others non-marketed; some being on-site, others off-site. The goods that are marketed are poles, small timber, charcoal, and tannin from the bark of the mangroves, crabs, crustaceans, and fish. Mangroves also provide sites for aquaculture of shrimps, molluscs, and fish, and salt and honey production. The non-marketed benefits include medicinal uses of mangrove produce, fuelwood collected for domestic use, value of the mangrove as a fish nursery and spawning and feeding ground, shelter for birds, and recreational value. The mangrove ecosystem also provides a number of other environmental services.

Dunes and dune vegetation

Sand dunes are mounds of drifted sand on the beach topped with vegetation to prevent erosion of this accumulated sand. They arrest blowing sand and prevent it from affecting coastal populations, deflect wind upwards, and assist in the retention of freshwater. They protect the hinterland from attack by waves, cyclones, and storm surges, thus obstructing the ingress of saline marine water into the hinterland and protecting the hinterland lowlands from attack by the forces of the ocean. Their peculiar topography provide 'sights' upon which recreational activity is based (Siqueira 1999) and 'sites' around which tourism is planned. They maintain coastal ecological equilibrium by supplying and restoring sediments lost due to erosion in the coastal zone. Dune vegetation contains many species of specific flora (and fauna) and thus are an ecological storehouse rich in genetic diversity.

Khazan *lands*

The *khazans* are agro-ecosystems found on the Konkan coast. These are lands that have been reclaimed over centuries from marshy mangrove swamps. *Khazan* lands have increased the agricultural potential of mangrove swamps and coastal saline soils. *Bunds* (embankments) built on them have reduced salinity and flooding. *Khazan* lands are highly adaptable and can be used for agriculture during monsoon when the salinity goes down, for pisciculture after monsoons, and for salt manufacturing during summer when the water is drained out. Over centuries, *khazan* farmers have cultivated rice, selecting and replanting the best strain. Besides agriculture, fish farming in the mangrove area is very common. The salt pans are also a part of reclaimed mangrove areas or the *khazan* lands. They are used to collect and evaporate water from the sea or estuaries to prepare crude salt.

Results of the survey

This section reports on the (1) coastal resource use, (2) perceptions of change, (3) perception of threats, (4) attitudes to protection, and (5) personal and community dependence.

Resource use

The objective here was to determine the personal and/or community uses made of the ecosystem and to identify the economic and environmental uses of the ecosystem. Table 1 presents the most important uses reported in the survey.

It is observed that community uses of ecosystems are much higher than personal uses of ecosystems. This response holds across tourist destinations. Among the ecosystems, mangroves are of least personal use (18%), followed by sand dunes (40%) and *khazans* (54%).

Table 1 Most important uses of ecosystems

Ecosystem	*Personal*	*Community*
Sand dunes	Building purposes	For coconut plantation, to reduce sea water ingress
Mangroves	Fuelwood	Fuelwood, prevention of erosion, protective *bunds* of *khazans*
Khazan lands	Salt-making	Salt-making, paddy cultivation, prawn farming

Source TERI (2000)

Community uses are also distributed with higher percentage of use for *khazans*, followed by dunes and then mangroves.

Perceptions of areal changes in ecosystems

The survey reveals that the majority of households (78%) feels that there has been a decrease in these coastal ecosystems over the last 15 years. Among these, the response is highest for sand dunes (68%), followed by *khazans* (40%) and mangroves (20%).

Perceived threats to coastal ecosystems

Figure 1 shows the responses with reference to tourism and non-tourism threats. Non-tourism threats are higher than tourism threats; however, it is important to note that non-tourism includes pressures such as settlements, natural forces, fishing, and lack of interest.

Statistical analysis showed the following.

1 Across all villages, the impact on mangroves is not seen to be from tourism or tourism-related activities, but rather from settlements or pisciculture.

2 Only 30% of the households felt that degradation of *khazan* land was due to tourism. Households of all villages felt that lack of interest in paddy cultivation was the dominant driver for the decline.

3 The major threats to dunes are seen to be tourism and settlements.

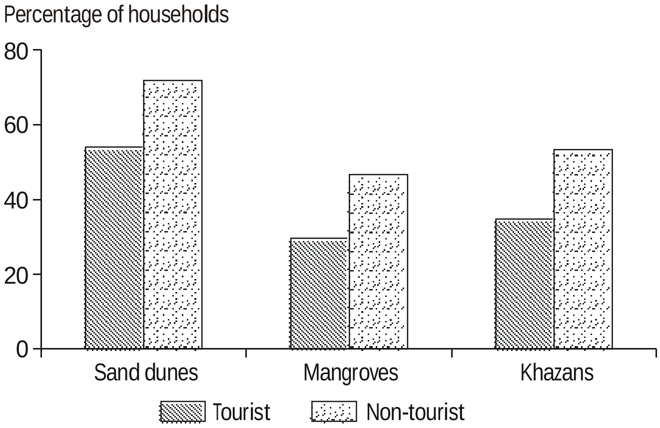

Figure 1 Perceived tourism and non-tourism threats to ecosystems

Attitude to protection of ecosystems

Over 80% of surveyed households felt that sand dunes and *khazan* lands need to be protected while 67% households supported mangrove protection. In the non-tourist village, a larger number of households supported the protection of mangroves. All tourist destinations showed a more protective attitude towards sand dunes and *khazan* lands. Households responded that they were in favour of protecting coastal ecosystems because (1) other villagers depended on them, (2) they were part of village resources, (3) they protect the village (sand dunes), and (4) they had always been there (mangroves and khazan lands). Interestingly, personal uses were not mentioned.

Personal and community dependence

With regard to dependence, an important finding is the difference between personal and community uses. Personal uses across all ecosystems are more economic in nature. In the case of community, the ecosystems are valued for both economic and ecosystem uses. The most common personal use of mangroves is its economic use for fuelwood, prawn farming, fishing, and as fish breeding grounds, and the protection of the *bunds* of the *khazan* lands. The most valued economic benefit is that it is a source of fuelwood, a consumptive use which can lead to the destruction of mangroves if drawn on excessively. In the community uses, mangroves are valued as a source of fuelwood, followed by its use for traditional prawn farming and fishing, as fish breeding grounds, and an ecosystem that protects the coast from erosion. Thus, in the case of both personal and community use of mangroves, it is the consumptive use that is valued the most, which can lead to its destruction.

In case of sand dunes, the most important personal use was the protection it provided houses from winds, followed by the consumptive use for construction, glass-making, and coconut plantations and, finally, for recreational purpose.

Table 2 shows the differences in the perceptions of the households in the tourist villages and those of the non-tourist village regarding the three ecosystems.

Conclusion

A high level of environmental activism that has accompanied the development of tourism in Goa may

Table2 Perceptual differences in the two types of destinations

Tourist destination	Pristine destination
The more educated reveal greater awareness	The less educated reveal greater awareness
Less-than-30 age group is more aware	More-than-50 age group is more aware
Major threat to the ecosystem is perceived to be from tourism	No major threat to ecosystem is perceived

partly explain the different results obtained for education and age for the two types of destinations. This activism has attracted the attention of the youth and the educated in the tourist destination, who may otherwise have been more distanced from the ecosystems relative to those in the pristine areas. This suggests that support of environmental activism can be an important catalyst in generating awareness and concern for coastal ecosystems.

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Reporting on new research: the spatial impacts of European Union rural environment policies

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Policies can be important drivers of change with a strong ability to structure the social and the economic organization. Given this, the authors have embarked on a research study to examine the significance of the European Union agricultural, rural, regional, and environmental policies on land-use change.[1]

However, policy impacts vary according to the regional contexts, which means that the same policy can have different effects on development and on the capability to create conditions for regional sustainable development, depending on the socio-economic and biophysical conditions.

An understanding of policy impacts pre-supposes an analysis of the regional context and involves local analysis in order to explain the behaviour of social groups. In fact, the analysis of the processes of rural development and their articulation with external driving forces, such as policies, is only possible by considering regional and local dynamics.

The research on the significance of policies will be based on a cross-disciplinary approach integrating both socio-economic and biophysical dimensions. The methodology will be developed to understand the problem progressively at various levels – national, regional, and local – using different techniques according to the specific characteristics of the aspects that are the object of analysis.

One of the main challenges in the elaboration of the methodology, conceived as a tool to monitor and assess the changes, is to integrate the information from different sources and of different types and different scales into a model. The team's skills and experience will be helpful to achieve this objective. A frame that will integrate both socio-economic and biophysical dimensions will be developed to study the impact assessment of policies in rural areas, which will contribute to support the decision-making process.

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[1] Spatial Impact of Rural Environment EU Policies: a regional comparative analysis of land use (SIMLUC). Universidade Atlântica. Funded by European Commission, DG Joint Research Centre, Space Applications Institute.

Forthcoming events

St. Petersburg, Russia 25–30 September 2000	International training workshop on Integrated Coastal Area Management and its Integration with Marine Sciences *E-mail* ggg@sici.ru
Amman, Jordan 4–11 October 2000	Second World Conservation Congress *Fax* +41 22 999 0001
Venice, Italy 9–13 October 2000	'Oceans from Space' symposium *Fax* +39 0332 789034 • *E-mail* vittorio.barale@jrc.it • *Web* www.me.sai.jrc.it
Isle of Skye, Scotland, UK 16–20 October 2000	ISISA Islands of the World VI Conference 'Small Islands in the Third Millennium: sharing solutions to common problems' *Fax* +44 1478 613254 • *E-mail* graeme@islandstudies.org *Web* www.islandstudies.org/conf/
Douglas, Isle of Man, UK 18–21 October 2000	Irish Sea Conference 2000 *E-mail* H.Davies@liv.ac.uk
Bremerhaven, Germany 23–26 October	International conference on 'Sustainable Developments of Coastal Zones and Instruments for its Evaluation' *E-mail* fothm@cdg.de
Groningen, The Netherlands 31 October–3 November 2000	10th International Scientific Wadden Sea Symposium *E-mail* c.j.m.van.berkel@lnvn.agro.nl
Cairo, Egypt 13–16 November 2000	Workshop on Marine Turtle Biology and Conservation in the Mediterranean *Web* www.qmw.ac.uk/~ugbt771/ • *E-mail* a.c.campbell@qmw.ac.uk
The Hague, The Netherlands 13–24 November 2000	Sixth Session of the Conference of the Parties to the UN Framework Convention on Climate Change *E-mail* Secretariat@unfccc.de • *Web* http://cop6.unfccc.int/
Edinburgh, UK 15–16 November 2000	Conference on establishing management on UK marine special areas of conservation 'Marine SAC's: Partnership in Action' *Fax* +44 1733 568834 • *E-mail* john.torlesse@english-nature.org.uk
Edinburgh, UK 20–22 November 2000	Ecological Status of Transitional & Coastal Waters 'Towards Classification for the EC Water Framework Directive' *Fax* +44 1786 448040 • *E-mail* sniffer@sepa.org.uk
Shahid Radjaee Port Complex, Iran 21–24 November 2000	'ICOPMAS 2000' 4th International Conference on Coasts, Ports and Marine Structures *Fax* +98 21 8904193 • *E-mail* icopmas@ir-pso.com

CORRIGENDUM

In *Coastin* March 2000, we carried an article on 'Estimating socio-economic impact of alternative fishery management regulations' by Dr Ramachandra Bhatta. We would like to point out that the bio-socio-economic model illustrated therein was reproduced from the article by J Parikh and K Parikh in *Environmental Accounting and Valuation*, Volume 1, 1997, ESCAP, United Nations. Further, this article is based on the study funded by the Technical Assistance Project for the Environment Management Capacity Building by the World Bank from the component 'Environmental Economics Research' coordinated by the Indira Gandhi Institute of Development Research. We regret that this acknowledgement was left out in the article.

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