

Management of the Belgian coast: Opinions and solutions

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Abstract. Since the beginning of the 20th century the Belgian coast has undergone important changes of which an overview is presented here. To determine the view of the Belgian public on the Belgian coast and in order to obtain their opinions and solutions to the problems along the Belgian coast, a questionnaire survey was conducted with a total of 100 respondents divided into five groups, all active in the coastal zone. The five groups included (1) politicians on various levels of authority, (2) coastal entrepreneurs and business people, (3) naturalists and scientists, (4) coastal residents and (5) tourists. Coastal zone problems, as perceived by the different groups, and their solutions are discussed. Former municipalities, in particular, were held responsible for the current coastal problems. Most respondents were skeptic about the application of recent juridical instruments (e.g. the Dune Decree), the structural plans and their power to protect the remaining natural areas. The root of the problems seems to lie in lack of coordination and communication between different authorities responsible for the coastal zone.

Keywords: Coastal stakeholder participation; Coordination; Overdevelopment.

Introduction

Due to the ever increasing demands from tourism, undeveloped coasts all over the world are under severe pressure for development. Unfortunately, the authorities often lack the vision and experience to develop the coastline in a sustainable way.

The literature abounds with coastal management problems in most countries bordering a large body of water (Carter 1988; Fabbri 1990). Due to various past influences, the Belgian coastline is considered one of the worst examples of coastal planning (Bossu 1991; Anon. 1992a; Seys et al. 1993; Herrier 1994; Baeteman 1995; Maes & Cliquet 1996; Provoost & Hoffmann 1996). Although currently much is done to correct past mistakes (Herrier 1998), some are irreversible and the lessons learnt were very expensive.

The aim of this study is to review the history and current state of the Belgian coast and to determine the problems perceived or experienced by different stake-

holders of such an overdeveloped coastline. In addition, an attempt was made to trace the origin and causes of the problems as well as to provide possible solutions. We were also interested as to whether coastal problems, as reflected in the literature, agree with those which different groups of coastal stakeholders perceive and experience along the Belgian coast.

The Belgian coast – a review

The area

The Belgian coastline along the North Sea is 65.4 km long. Several sand banks on the shallow continental shelf are the habitat and feeding grounds for marine birds, fish and invertebrates (Seys et al. 1993; Herrier & Thomas 1995) and are exploited for sand used in building and for beach replenishment (Provoost & Hoffmann 1996). Due to marine erosion and coastal defence – protection of the low-lying coastal plain – a major part of the sandy coast is interrupted by stone breakwaters and concrete dikes (Herrier & Thomas 1995). 35 km of the coast is protected by dikes and 26.8 km by dunes, with or without dune base reinforcement (Anon. 1993a). Only two salt marshes are left: those of the Ijzer estuary at Nieuwpoort and the tidal inlet 'Zwin' (Fig. 1). These marshes provide important feeding grounds for coastal birds and waders (Herrier & Thomas 1995). The Zwin complex, a 530-ha privately owned nature reserve on the Belgian/Netherlands border with tidal creeks, salt marshes, mud flats, dunes and coastal forest, is listed as a Ramsar site (Law of 22.02.79; De Pue et al. 2000) of global importance with a priority international protection status. It is currently in danger of silting up by past beach replenishments at Knokke-Heist in 1977 and 1986 (Provoost & Hoffmann 1996).

The Westhoek is a 340-ha dune reserve at De Panne on the border with France. Here, wandering and active parabolic dunes still exist and the integrated coastal system of sea/beach/dune/polder is almost intact. Apart from the two above-mentioned reserves, Doornpanne (200 ha - Koksijde), Domeinbos Klemskerke-Vlissegem-



Fig. 1. Map of the Belgian coast showing seven of the 16 coastal municipalities and the main roads to the coast.

Wenduine (150 ha – De Haan) and the dune complex of Ter Yde (258 ha – Oostduinkerke), nine of the 20 coastal reserves are less than 20 ha in size (Provoost & Hoffmann 1996) and are thus not ecologically independent, nor sufficiently buffered from the direct surroundings, which makes survival of the inhabitant (parts of) animal and plant populations more difficult.

At the beginning of the 20th century the coastal dunes, constituted by foredunes, primary vegetated dunes, and active wandering dunes with slacks and salt marshes, spanned the entire Belgian coast. The original settlements were located along the inner dune fringe close to the polder area. The first major attack on the dune belt started in 1885 when a coastal tramway was constructed through the dune fields. This was followed by the Royal Coastal road (N34), completed in 1933, which encouraged the founding of coastal towns within the dunes in the zone closest to the sea (Baeteman 1995). The biggest disruption came after the Second World War with the increase of mass tourism resulting in construction of holiday homes and apartments, camping grounds, holiday villages and parking areas within the dune fields (Bossu 1991). The expansion of coastal towns towards each other resulted in ribbon development along almost the entire coast (Anon. 1992c), with foredunes presently existing along only 26.8 km of the 65 km coast (Bossu 1991). Legal protection was offered under the Law on Town and Country Planning (29.03.62). However, the delay in the development of plans resulted in the loss of large areas with a 'green' destination. The new Decree on Country Planning (08.06.99) requires the creation of structural plans on regional (Flemish), provincial and municipal levels.

Currently, of the 6000 ha dune field, only 3500 ha remain undeveloped, of which only 2500 ha are designated as green areas (Herrier & Thomas 1995). According to an earlier regional structure plan, the rest was classified as residential, recreational or military areas (400 ha) or agricultural land (600 ha) (Herrier 1994). This means that 40% of the coastal dunes are urbanized. Of the remaining unaffected dunes, 50% are privately owned (Provoost & Hoffmann 1996). The dunes are currently threatened by trampling by tourists, expansion of the Zeebrugge and Oostende harbours and dune water extraction (Maes & Cliquet 1996). In spite of the Dune Decree of 1993 prohibiting construction on the dunes, there still exists pressure for speculation and construction of holiday accommodation, recreation and parking sites and the layout of golf courses (Maes & Cliquet 1996).

Tourism

Tourism along the Belgian coast has increased by 38% (in terms of visitor numbers) between 1965-1992 (Anon. 1992d), with almost 12.5 million visits recorded in 1991 (Anon. 1992c) of which 9.5 million occurred from April to September. 85% of the tourists are Belgians; the remainder are Germans, Dutch, French and other nationalities (pers. comm. Mr. P. Borean, Westtoerisme). In contrast to longer visits, one-day tourism has increased over the past years. This trend is expected to continue in the future and, linked to the strong seasonality of coastal tourism (78% of visits in summer), is expected to further deteriorate the already existing traffic congestion and parking problems in the coastal towns.

In 1990 the total tourist accommodation capacity in the Belgian coastal zone was 491 000 beds, of which 60% were contributed by 59 000 rental apartments and second homes. In the coastal towns, hotels and 159 camping sites (of which 48 sites were unlicensed), contribute 6% and 26% to the tourist accommodation capacity, respectively. Seven camping sites were situated in the dunes, three of them unlicensed and illegally situated, e.g. on dunes at Blankenberge, Lombardsijde and Westende (Anon. 1992c). In the 65 km long coastal zone, 57.5% of the urbanized area is occupied by recreational sites and infrastructure related to tourism (Maes & Cliquet 1996).

Current recreative facilities along the Belgian coast are of a small scale, classic type with limited variety and badly integrated with each other (Anon. 1992c). Since they are open for only a restricted period of the year, and suffer from unpredictable weather, they have little chance of competing with more sunny destinations that provide more modern facilities.

Coastal zone management

Management of the coastal zone in Belgium is the collective responsibility of institutions at local, regional and federal levels, and is thus highly fragmented (Herrier & Thomas 1995). The three principal authorities in charge are: the Federal government – from the (12 km) seaward border of the territorial sea inland, the Regional authority – from the baseline (= low water of low water springs) inland, and local municipalities – responsible for the cleanliness of beaches (Maes & Cliquet 1997). The entire coastline lies in the Province of West-Vlaanderen in the Flemish Region of Belgium.

Considering only nature conservation along the coast, the following parties are involved: (1) the Ministry of Social Affairs, Public Health and Environment, (2) the province of West-Vaanderen, (3) the division Nature, (4) the division Forest & Green, (5) the division Coastal Waterways Division, the latter three of the Flemish Community, and (6) all 16 coastal municipalities and local authorities (Provoost & Hoffmann 1996).

Of the 1134 ha dunes currently (1999) owned by the Flemish Region, 350 ha belong to Coastal Waterways Division (pers. comm. R. Longueville). These dunes are principally maintained for coastal defence purposes. This entails the planting and fencing off of dunes against trampling, reinforcing dune bases, beach nourishment, constructing breakwaters and boardwalks and removing war bunkers (Anon. 1991). Important parts of the coastal area, e.g. 'Het Zwin' and the Flemish (sand)banks, are designated as Bird Directive (79/409/EEC) and Habitat Directive sites (94/43/EEC). These enjoy special protection status (De Pue et al. 2000).

The increased environmental awareness of the Flemish Community and the growing importance of nature for tourism is reflected in the latest mission statement and policy document for 1995-2000 of the Flemish Directorate-General, 'Toerisme Vlaanderen'. The aim of developing sustainable tourism is based on respect for the local inhabitants and the existing natural areas and environment as well as cultural resources. Thus the current policy is one of halting unbridled tourist and economic expansion in favour of nature conservation, the renovation and greening of coastal city centres and promoting forms of recreation that respect nature (Anon. 1995). The current amended laws on nature conservation and the Nature Development Plan proposed by the regional Minister of Environment in 1990 (Kelchtermans 1990) also aim at sustainable development and restoration of natural areas, environmental quality of ecological standards and greening of cities, the increase of biodiversity of plants and animals, and environmental education of the public. This minister has also established a steering committee on inte-

grated coastal zone management with the protection and management of two integrated coastal reserves (the Westhoek and Het Zwin) as their first task (Herrier & Thomas 1995). Part of the sandbanks (coastal and Flemish banks) has recently been declared a marine reserve.

To counteract the further destruction of the remaining privately owned dunes, the Dune Decree, proposed in 1993 and amended and ratified in 1995, prohibits any fragmentation of and construction in dunes and agricultural areas important to the dunes (Maes & Cliquet 1996). Further recommendations to protect dunes by the Coastal and Dune Work Groups of 'Natuurreservaten vzw', (an NGO) are to:

(1) create a fund to buy dunes like the Conservatoire de l'Espace Littoral et des Rivages Lacustres, a parastatal institution buying up valuable sites along the coast of France (Meur-Ferec 1995);

(2) obtain the legal rights to expropriate privately owned dunes or force owners to properly manage their dunes (only 10% of the Belgian dunes are properly managed);

(3) prohibit dune water extraction;

(4) remove illegal camping sites and restrict access in order to decrease trampling of the dunes (Maes & Cliquet 1996).

The '10-point plan for integrated coastal management along the Belgian coast' (Anon. 1994, 1999) proposes (apart from protecting and buying dune areas and dune-polder transition zones and managing them correctly) to actively create larger nature reserves and integrate and reconstitute continuity from the sea, across the beach, dune and polder areas to allow natural processes to occur at certain sites where the coastal population is not in danger. This is very difficult to put into practice and requires considerable intervention, good communication and considerable funds. Nevertheless, progress has already been made (Herrier 1998; Herrier & Killemaes 1998). Several active nature restoration projects have been planned (some already in progress or completed) similar to those in The Netherlands (de Ruij 1998) and Germany (Goeldner 1999), where dynamic natural processes are allowed to occur in sites where the coastal defence system will not be put in jeopardy.

Although it would be better for the recovery of damaged natural areas, the latest nature conservation policy is not to exclude tourists from nature areas but to try to nurture appreciation for nature by allowing limited and guided access. Guided walks and hardened paths through the dunes increase nature appreciation and prevent trampling (Provoost & Hoffman 1996). The Nature Conservation decree of October 1997 provides a more legal base for nature management and forces private owners to manage their dunes properly (Provoost & Hoffmann 1996).

Coastal management problems

As in many other countries, e.g. the UK (Ballinger et al. 1996), Portugal (Granja 1996) and Australia (Kay & Alder 1995), the lack of integration and cooperation between different levels of authority along the Belgian coast causes several problems. Existing laws and rules are not strictly applied in a coordinated way. Despite the legal power of the Dune Decree, several exceptions to it have already been requested, i.e. to build villas in the Zwin nature reserve and to lay out a golf course in the Lenspolder at Nieuwpoort. At the time of this study (1997), building was still continuing in the dunes (Maes & Cliquet 1996). The struggle for dune protection is further complicated by competition for land from the agricultural sector. The sandy soils of the transition area from dune to polder can be used for intensive agricultural practices such as growing potatoes, vegetable and flower production in glass houses and pig breeding. This practice further lowers the water table and allows introduction of fertilizers, pesticides and pig slurry, apart from the loss of land through construction of farm buildings.

Currently, 2750 ha of ecologically valuable dunes still exist but they need management. Only 20% of the protected dunes (at the Westhoek, Ter Yde and the Ijzer estuary) are currently managed properly whilst the rest is left to invasion by undesirable vegetation (Provoost & Hoffmann 1996). To avoid loss of species on the dunes by the overgrowth of *Hippophaë rhamnoides*, *Salix repens*, *S. cinerea* and *Ligustrum vulgare*, a combination of extensive grazing, grass cutting, shrub hacking and even sod removal is necessary. At the time of this study, with only two nature conservation officials for an area of 525 ha, the lack of personnel was a restricting factor (Provoost & Hoffmann 1996). From experience in France and The Netherlands, one warden per 100 ha is necessary; thus five would be needed for the West coast alone (Provoost & Hoffmann 1996). Recently, a staff increase to about 10 officials has improved the situation.

Currently, infiltrated rain water in the coastal dune area is utilized as a source of drinking water – not only in cases of emergency. Three quarters of the 20 000 m³/day of water used on a tourist peak day is obtained from the dunes (Anon. 1992c). This extraction leads to a considerable lowering of the water table level, resulting in dieback and alteration of dune vegetation (Maes & Cliquet 1996).

Further problems are the severe traffic and parking problems during the peak season and the expansion of the Zeebrugge harbour which will destroy the breeding grounds of important coastal bird species (Provoost & Hoffmann 1996). The construction of an artificial peninsula will hopefully provide alternative breeding sites. Education of tourists is also crucial, but is in its infancy.

Methods

A questionnaire survey was held from May-July 1997 per telephone or personally with a total of 100 respondents belonging to five groups, all in some way actively involved in using or managing the Belgian coast. The five groups entailed:

1. Politicians, policy makers and executives e.g. environmental officials of coastal towns and members of local councils. These respondents came from various levels of authority, i.e. the federal government, Flemish Community, provincial and local councils.

2. Entrepreneurs in the coastal zone, i.e. business people, tourist officials of local and provincial authorities, estate agents and building constructors active within the coastal zone.

3. Naturalists, i.e. scientists (ecologists, botanists, zoologists, geomorphologists, etc.) involved in research projects in the coastal zone as well as activists for nature and dune protection, members of nature conservation groups such as Natuurreservaten vzw.

4. Inhabitants, i.e. local residents that live permanently in the coastal zone.

5. Tourists who visit the coast purely for vacation, including those that have a holiday house on the coast.

Naturalists were contacted at nature conservation organizations, universities and research institutes active along the coast. From them, names of politicians active in the coastal zone were obtained. Respondents in the other groups were selected at random from telephone books of the coastal towns and, by questioning, were classified into entrepreneurs, inhabitants or tourists. Each interview lasted from 10 - 55 minutes. The large variation in questioning time was due to the fact that some respondents needed explanation of terms such as carrying capacity, biodiversity, sustainable development, etc., while others were closely involved in coastal issues and gave extended opinions or vented their frustrations. It was stressed that all opinions would be treated strictly confidential and that all data would be used in an anonymous way. Subsequent to pre-testing the questionnaire, we decided, due to the limited time available, not to include non-users since it was very difficult to obtain respondents in this group that were prepared to cooperate.

The respondents were asked to judge their personal knowledge of coastal problems on a scale from 1 (very poor) to 5 (very good). They then had to judge the clarity and accuracy with which scientists, the media, interest groups and municipalities offer information about the coastal zone and its problems. They were asked to mention all problems along the Belgian coast and their possible solutions. Furthermore, they were asked to list the problems/frustrations they personally experienced

in their activities on the coast (as opposed to the general ones mentioned earlier). The seriousness of the problems were assumed to be proportional to the frequency with which they were mentioned, i.e. the problems mentioned by more respondents being more widespread and pressing than those mentioned by few respondents.

Respondents were asked what their opinion was about the current nature conservation policy and what effect they thought it would have in the economic, social, ecological, tourist and agricultural domain along the Belgian coast. Their comments on the coastal structure plan (Anon. 1992a-c) for the Province West-Vaanderen (including the entire coastal zone) was requested and what influence they expected the plan to have on the coast in the future. What hopes they had in the Dune Decree being actualized was also estimated.

Respondents were asked to evaluate the importance of several statements related to the coastal zone using a scale from 1 = not important to 5 = very important (see Table 10). The percentage of respondents giving different scores were shown – e.g. 52% of respondents allocated a value of 5 to the statement: ‘economic and industrial expansion controlled’. Finally, respondents were asked who or what they thought was most responsible for the current coastal problems and what their vision on the future of the coast was. The full questionnaire is available from co-author Roger Langohr at roger.langohr@rug.ac.be

Statistical tests

The rating of personal knowledge of coastal matters and problems and the differences in the rating of clarity of information offered by scientists, the media, interest groups and local authorities were tested for by the Kruskal-Wallis (Siegel & Castellan 1998, p. 206; Sokal

& Rohlf 1995, p. 423) and the multiple comparison of medians test (Zar 1984, p. 202; Siegel & Castellan 1988, p. 213). The same procedure was used for testing significant differences between the groups of respondents in median scores given to evaluate the importance of issues in the coastal zone (Table 10). Cluster analysis was performed on the problems mentioned and solutions suggested by the different respondent groups to detect differences among them. STATISTICA 4.2 (Anon. 1993b) was used for all statistical analyses.

Results

Personal knowledge of coastal zone matters and problems were rated highest by the naturalists and politicians and lowest by local inhabitants and tourists (Table 1). There was also a significant difference in the rated clarity of information on coastal zone matters conveyed by different groups with information offered by the media and interest groups being rated higher (clearer, more accessible and more understandable, although sometimes inaccurate) than that offered by scientists and local authorities/councils in the coastal zone.

Only 2% of the respondents, all of them residents of the coastal zone, were generally satisfied with the condition of the Belgian coast (Table 2, bottom). The 10 most frequently mentioned problems in the coastal zone (Table 3) were similar between groups although each group had unique problems it considered important. In all groups, (1) the ribbon development of high apartment buildings along the coastline and (2) the lack of nature and nature protection were considered the most serious problems. Entrepreneurs, however, mentioned the problem of overdevelopment the least of the five groups. Politicians, entrepreneurs and naturalists considered the

Table 1. Median score (with mode - m stands for multiple modes) allocated by respondents to their personal coastal zone (CZ) knowledge and the clarity of information given by different groups active in the coastal zone (scale from 1-5 with 1 = very poor, 3 = average and 5 = very good).

| Respondent groups | Personal knowledge of the coastal zone * | Information from scientists (A)* | Information from media (B) | Information from interest groups (C)* | Information from local authorities (D) |
|-----------------------------------|--|----------------------------------|----------------------------|---------------------------------------|--|
| 1. Politicians | 4.0 (4) | 3.0 (2) | 3.0 (m) | 3.0 (4) | 2.0 (m) |
| 2. Entrepreneurs | 3.5 (m) | 2.0 (1) | 4.0 (4) | 4.0 (4) | 3.0 (m) |
| 3. Naturalists | 4.5 (5) | 2.5 (2) | 3.0 (m) | 4.0 (4) | 2.0 (m) |
| 4. Inhabitants | 2.0 (2) | 2.0 (1) | 3.0 (3) | 2.0 (4) | 3.0 (3) |
| 5. Tourists | 2.5 (2) | 1.5 (1) | 3.0 (3) | 2.5 (m) | 2.0 (1) |
| Median (all respondents combined) | 3.5 (3) | 2.0 (2) | 3.0 (3) | 3.0 (4) | 2.0 (3) |

Statistical analyses

Kruskal-Wallis results for differences in personal CZ knowledge between groups 1-5 $H = 20.1 (4, N = 101)$ $p = 0.0005$ Multiple comparison of means test: Group 1 and 3 > 2 > 4 and 5; CZ knowledge of politicians and naturalists > entrepreneurs > inhabitants and tourists

Kruskal-Wallis for the difference in information given by groups A - D $H = 32.9 (3, N = 403)$ $p = 0$ Tukey type multiple comparison of means test: Info from media and interest groups (Groups B and C) > than from scientists and local authorities (Groups A and D).

*Some gave scores between two ranks, i.e. 2.5 between 2 and 3.

lack of integrated long-term structural planning and the lack of strict application of rules (e.g. Dune Decree) and past structural plans second in importance, while inhabitants and tourists rated the traffic problems and environmental degradation by mass tourism as second in importance. The latter problem was also mentioned by 90% of the naturalists. Naturalists, inhabitants and tourists also complained about the fragmentation of nature and dunes as well as the continued construction on dunes. Naturalists and politicians found that too much authority was given to the local municipalities and lamented the lack of legal binding power of the structural plans for the coastal zone. Traffic problems were mentioned amongst the 10 most important problems by all groups except the naturalists, who probably avoid the coast during holidays. Commonly mentioned problems unique to some groups were the following:

- Mainly entrepreneurs considered the aging of coastal city centres, e.g. Oostende, the low tourist quality and

the lack of investment in tourism by the government and private sector a serious problem.

- Especially naturalists were highlighting the extraction of drinking water from, and the drying out, of dunes as a problem.
- Naturalists and tourists additionally feared for the degradation of the polder-dune transition zone (by intensive agricultural practices and massive camping sites) and found pollution of the sea water and air due to traffic congestion disturbing.

Cluster analysis according to the problems mentioned split the respondents into two clusters at 82% dissimilarity level (Fig. 2). Problems mentioned by politicians were different from those mentioned by the other four groups constituting the second cluster. Within the latter cluster the problems mentioned by naturalists and tourists were the most similar, suggesting that tourists are well informed and nature conservation minded.

There were a lot of similarities between the groups in

Table 2. List of general problems along the Belgian coast. Percentage of 20 respondents in each of five groups with the same opinion.

| Problems in the Belgian coastal zone | Politicians % | Entrepreneurs % | Naturalists % | Inhabitants % | Tourists % | All % |
|---|---------------|-----------------|---------------|---------------|------------|-------|
| Lack of nature/no nature protection | 85 | 75 | 100 | 70 | 80 | 82 |
| Coast overbuilt /ribbon development | 75 | 55 | 95 | 85 | 90 | 80 |
| No strict application of rules or plans | 80 | 75 | 90 | 45 | 40 | 66 |
| Dune speculation/construction on dunes | 60 | 45 | 75 | 50 | 75 | 61 |
| Lack of structural planning/ structural chaos | 70 | 70 | 90 | 40 | 25 | 59 |
| Fragmentation of nature or dunes | 50 | 35 | 65 | 50 | 80 | 56 |
| Too much traffic/coast too accessible by car | 45 | 60 | 30 | 75 | 70 | 56 |
| Environmental degradation by tourism (noise, trampling, waste, vandalism) | 50 | 30 | 90 | 60 | 45 | 55 |
| Mass weekend and summer tourism/ one day tourism | 60 | 20 | 65 | 50 | 45 | 48 |
| Structural plans and Dune Decree not legally binding | 65 | 30 | 60 | 25 | 20 | 40 |
| Too much power to the local authorities | 45 | 30 | 60 | 5 | 0 | 28 |
| Polder-dune transition degradation | 50 | 0 | 45 | 0 | 40 | 27 |
| Too much emphasis on tourism and industry or economy | 40 | 5 | 40 | 30 | 15 | 26 |
| Conflict between different interests | 35 | 30 | 35 | 10 | 5 | 23 |
| Fragmentation or overlap of authority in the coastal zone | 35 | 30 | 40 | 5 | 0 | 22 |
| Pollution of air and sea water | 15 | 10 | 10 | 30 | 40 | 21 |
| Aging or degradation of coastal cities | 25 | 55 | 15 | 0 | 10 | 21 |
| Lack of money for buying privately owned dunes | 40 | 5 | 55 | 5 | 0 | 21 |
| Dune water exploitation | 25 | 0 | 60 | 5 | 5 | 19 |
| Lack of communication between local authorities and the public | 20 | 25 | 25 | 15 | 0 | 17 |
| Low touristic quality | 10 | 55 | 5 | 10 | 0 | 16 |
| Slow and illogical or corrupt political processes | 20 | 25 | 25 | 10 | 0 | 16 |
| Too little investment into tourism by government and private sector | 5 | 55 | 0 | 10 | 0 | 14 |
| Dune trampling | 40 | 0 | 20 | 5 | 5 | 14 |
| Illegal campings on dunes | 35 | 0 | 20 | 0 | 0 | 11 |
| Lack of information – ecological or from authority | 5 | 35 | 10 | 0 | 5 | 11 |
| Touristic competition from southern countries | 5 | 25 | 0 | 15 | 0 | 9 |
| Dog excreta | 0 | 0 | 5 | 5 | 25 | 7 |
| Agricultural intensification/greenhouses | 15 | 0 | 20 | 0 | 0 | 7 |
| Coast is expensive | 5 | 0 | 0 | 10 | 15 | 6 |
| Unemployment | 0 | 5 | 5 | 20 | 0 | 6 |
| Duplication of facilities / lack of coordination between coastal towns | 5 | 20 | 0 | 0 | 0 | 5 |
| Sand collection on sand banks | 15 | 5 | 5 | 0 | 0 | 5 |
| Tourist education does not help | 15 | 5 | 5 | 0 | 0 | 5 |
| Beach erosion | 5 | 5 | 5 | 0 | 5 | 4 |
| Dunes owned by Flemish Region badly managed | 10 | 0 | 10 | 0 | 0 | 4 |
| Local inhabitants ignored/badly treated | 0 | 0 | 0 | 10 | 5 | 3 |
| Flemish Community does not recognize coast separately | 0 | 0 | 10 | 0 | 0 | 2 |
| Satisfied | 0 | 0 | 0 | 5 | 5 | 2 |

Table 3. The 10 general problems in the Belgian coastal zone mentioned most frequently by respondents in 5 different groups (extracted from Table 2). Percentage of respondents in each group mentioning a problem are shown. Empty cells mean frequencies too low for being considered amongst the 10 most important.

| Most mentioned problems in the Belgian coastal zone | Politicians % | Entrepreneurs % | Naturalists % | Inhabitants % | Tourists % | All % |
|--|---------------|-----------------|---------------|---------------|------------|-------|
| Lack of nature/no nature protection | 85 | 75 | 100 | 70 | 80 | 82 |
| Coast overbuilt /ribbon development | 75 | 55 | 95 | 85 | 90 | 80 |
| No strict application of rules or plans | 80 | 75 | 90 | 45 | 40 | 66 |
| Dune speculation/construction on dunes | 60 | 45 | 75 | 50 | 75 | 61 |
| Lack of structural planning/ structural chaos | 70 | 70 | 90 | | | 59 |
| Too much traffic/coast too accessible by car | | 60 | | 75 | 70 | 56 |
| Fragmentation of nature or dunes | 50 | 35 | 65 | 50 | 80 | 56 |
| Environmental degradation due to tourism (noise, waste, vandalism) | 50 | | 90 | 60 | 45 | 55 |
| Mass weekend and summer tourism/ one day tourism | 60 | | 65 | 50 | 45 | 48 |
| Structural plans (Physical planning) and Dune Decree not legally binding | 65 | | 60 | | | 40 |
| Too much power to the local authorities | | | 60 | | | 28 |
| Polder-dune transition degradation | 50 | | | | 40 | 27 |
| Too much emphasis on tourism and industry or economy | | | | 30 | | 26 |
| Pollution of air and sea water | | | | 30 | 40 | 21 |
| Aging or degradation of coastal cities | | 55 | | | | 21 |
| Dune water exploitation | | | 60 | | | 19 |
| Low touristic quality | | 55 | | | | 16 |
| Too little investment into tourism by government and private sector | | 55 | | | | 14 |
| Lack of information - ecological or from authority | | 35 | | | | 11 |

the most frequently suggested solutions to problems in the coastal zone (Table 4). The four most mentioned solutions in all groups were (1) better coordinated nature conservation, (2) long term structural planning along the entire coast as a unit, (3) commitment to and strict application of structural plans and rules in the coastal zone and (4) a halt to construction on dunes and fragmentation of dune and natural areas. All groups, but especially inhabitants (65%), tourists and entrepreneurs (each 50%) wanted improved traffic infrastructure and more parking space. Educating the public and tourists by providing information was considered an important matter by naturalists (60%), politicians (50%) and in-

habitants (40%). In addition, recreational variation for all weather conditions and nature recreation was mentioned frequently by all groups except tourists.

Some solutions mentioned were characteristic of certain groups:

- Active nature restoration (demolishing buildings in the dunes, expropriation of privately owned dunes, restoration of the salt marsh at the Ijzer estuary, allowing the sea to breach the foredunes at certain points) and the integration of sea, beach, dune and polders was suggested by 65% of the naturalists and more than half of the politicians (Table 4).

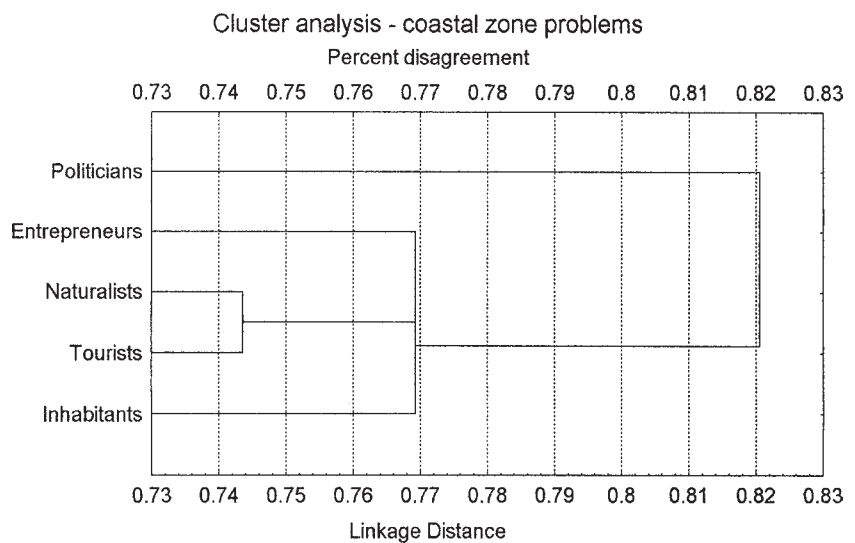


Fig. 2. Cluster analysis of respondent groups based on coastal problems mentioned.

Table 4. Solutions for the Belgian coastal problems suggested by respondents from 5 different groups. % signifies the percentage of respondents/group mentioning a specific solution.

| Solutions for the Belgian coastal problems | Politicians % | Entrepreneurs % | Naturalists % | Inhabitants % | Tourists % | All % |
|--|------------------|--------------------|------------------|------------------|---------------|----------|
| Efficient nature protection & conservation | 95 | 80 | 100 | 70 | 85 | 86 |
| Stop parceling out and building in dunes | 70 | 55 | 70 | 65 | 90 | 70 |
| Commitment to and strict application of structural plans and rules | 75 | 70 | 95 | 50 | 55 | 69 |
| Long term structural plan integrating the entire coast | 65 | 80 | 95 | 35 | 30 | 61 |
| Traffic infrastructure improved with more parking | 40 | 50 | 30 | 65 | 50 | 47 |
| Recreational variation for all weather including nature recreation | 40 | 50 | 40 | 30 | 0 | 38 |
| Dune Decree: financial and personnel support and subsidies | 45 | 15 | 80 | 15 | 5 | 32 |
| Give information and educate tourists and public | 50 | 0 | 60 | 40 | 10 | 32 |
| Renovation of coastal cities | 30 | 65 | 20 | 10 | 25 | 30 |
| Nature restoration by active intervention i.e. integration of coast and polder | 55 | 10 | 65 | 10 | 5 | 29 |
| Integration and coordination between different levels of authority | 50 | 30 | 35 | 5 | 0 | 24 |
| Sustainable development of the coast | | | | | | |
| /harmony between tourism, nature, industry and agriculture | 30 | 30 | 35 | 25 | 0 | 24 |
| Less power to the local authorities and municipalities | 40 | 30 | 45 | 5 | 0 | 24 |
| Control tourist access into dunes or nature | 40 | 5 | 40 | 10 | 5 | 20 |
| Improve touristic quality | 15 | 60 | 0 | 15 | 5 | 19 |
| Pollution monitor and control with e.g. fines | 25 | 5 | 5 | 25 | 35 | 19 |
| Protect polder-dune transition | 45 | 0 | 45 | 0 | 5 | 19 |
| Zoning for different purposes | 35 | 25 | 30 | 5 | 0 | 19 |
| Use alternative water sources to dune water | 30 | 0 | 50 | 10 | 0 | 18 |
| Promotion of coastal tourism (after renovation) | 5 | 45 | 5 | 15 | 0 | 14 |
| More public transport into and between coastal cities | 5 | 25 | 15 | 15 | 0 | 12 |
| Investment in tourism by government and private sector | 5 | 40 | 0 | 10 | 0 | 11 |
| Dune owners agreement - duty to protect dunes or expropriation | 20 | 5 | 25 | 0 | 0 | 10 |
| Spread tourism over the whole year | 15 | 20 | 5 | 10 | 0 | 10 |
| Guided recreation in nature | 35 | 0 | 0 | 0 | 10 | 9 |
| Narrow or interrupt the Royal Coastal road | 15 | 5 | 20 | 0 | 0 | 8 |
| Remove illegal campings on foredunes | 40 | 0 | 0 | 0 | 0 | 8 |
| Security and recreation for youths and children year round | 0 | 0 | 0 | 15 | 10 | 5 |

- Especially politicians (50%) found vertical and horizontal integration and coordination between different levels of authority important.
- Most naturalists (80%) found financial and personnel support and governmental subsidies essential to apply the Dune Decree effectively.
- Mainly entrepreneurs (65%) wanted renovation of coastal city centres to attract more tourists and suggested increased investment in tourism by the government and the private sector.
- Mainly politicians and naturalists (45% each) were concerned with protection of the dune-polder transition zone and suggested using alternative sources of water to that extracted from the dunes.
- Finally, only inhabitants (15%) mentioned better security and more recreational facilities for young people throughout the year.

According to the cluster analysis of respondent groups based on solutions offered for coastal zone problems, two distinct clusters emerged with politicians and naturalists in the first, and entrepreneurs, tourists and inhabitants in the second cluster (Fig. 3).

78% of the respondents thought that the current coastal problems could have been avoided (Table 5).

60% of the respondents felt that past governments should have done some long-term structural planning for the entire coastline as an integrated unit from the fifties onwards and should have applied this strictly. 4% felt that more appreciation for nature in the past would also have helped. Only 15% said that the overdeveloped coastline was an unavoidable and natural development after the war.

When asked about the current state of nature conservation along the coast, 39% of respondents felt that nature conservation had improved over the 3 yrs preceding the study, but 44%, especially inhabitants (60%) and tourists (80%), felt that more still had to be done (Table 6). Naturalists (30%) were most enthusiastic about active nature restoration, i.e. demolition of buildings in dunes followed by nature restoration, allowing transgression of the sea, recreating strips of integrated sea/beach/dune/polder systems. 10% of the politicians and 15% of the naturalists found the authorities' nature conservation actions insufficient. Politicians (20%) found that nature conservation lacked coordination and that there should be more support from the government for nature conservation in the form of increased finances and personnel.

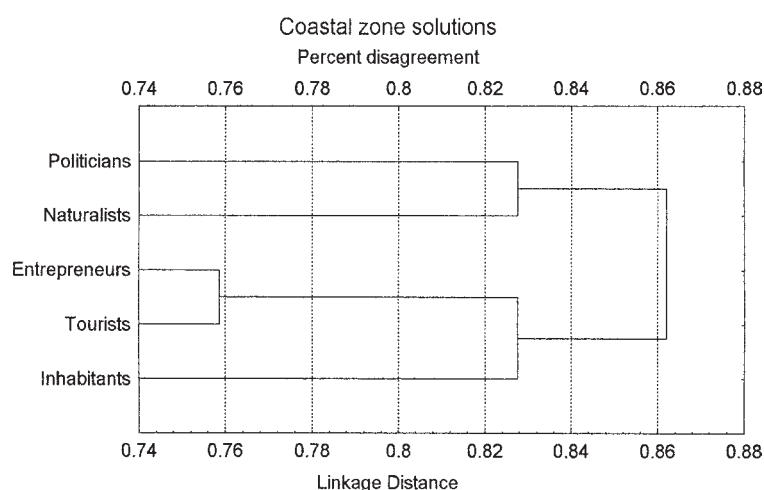


Fig. 3. Cluster analysis of respondent groups based on solutions mentioned.

The current nature conservation policy was expected by 43% of respondents to have zero effect on the economy in the coastal region, especially by naturalists, inhabitants and tourists (Table 7). 22% of the respondents believed that the economy would be positively, and 20 % that it would be negatively affected, while 13 % expected both positive and negative effects, depending on the situation. Especially politicians believed in positive (40 %) and both positive and negative effects (30 %), whereas entrepreneurs and tourists (both 35 %) were the most negative about the economic effect. On the social scene, 68 % of respondents expected a positive effect, 19 % a neutral and 4 % a negative effect, while 6 % did not know what to expect (Table 7). The greatest consensus was in the ecological and environmental field, where 99 % of respondents expected positive results. As far as tourism was concerned, 84 % of the respondents had high hopes for improvement, while 11% expected a neutral effect in this field. The effect on agriculture was believed to be neutral by 40 % of the respondents, while 34 %, especially entrepreneurs and tourists, did not know what to expect. Negative effects were expected by 16 % of the respondents. Unfortunately the expected frequencies in some cells were too low for statistical analyses for differences between

groups. Furthermore, combining categories with low frequencies e.g. 'Negative' with 'Positive or negative' (depending on the situation) was not meaningful and too much detail would be lost. However, comparing expected frequencies with observed ones (Table 7), gives an idea of where the deviations lie.

Only 21% of the respondents considered the structural plan for the coast reasonably good (Table 8), most being entrepreneurs (40%) and naturalists (30%). 14% considered it a drawback that the plan was only a guideline and not legally binding. A total of 24 % of all respondents did not know the structural plan, mostly inhabitants (45%), tourists (35%) and entrepreneurs (25%). Of the latter uninformed, 71% were, however, aware of the Dune Decree and approved of it. The category 'other' included singular responses such as 'Agriculture neglected' and 'Polder not sufficiently protected'. Only one respondent was certain that the structural plan would have a positive effect on the current problems in the coastal zone, 44% were skeptic, 35% hopeful (but uncertain) and 20% did not know. Similarly, when asked if they believed if the Dune Decree would be applied and would have a positive effect on dune conservation, only 1 respondent was certain, 50% were skeptic, 29% hopeful and 19% did not know.

Table 5. Could the coastal problems have been avoided and how? Opinion of different groups of respondents. % signifies the percentage of respondents/group giving a specific response.

| Could the coastal problems have been avoided? | Politicians % | Entrepreneurs % | Naturalists % | Inhabitants % | Tourists % | Total % |
|--|---------------|-----------------|---------------|---------------|------------|---------|
| Yes | 75 | 75 | 95 | 80 | 65 | 78 |
| No | 5 | 25 | 5 | 20 | 20 | 15 |
| Don't know | 10 | 0 | 0 | 5 | 20 | 7 |
| How?? | | | | | | |
| Long term structural planning & strict application | 70 | 65 | 70 | 55 | 40 | 60 |
| More appreciation of nature | 5 | 0 | 5 | 0 | 10 | 4 |
| Better pollution control | 0 | 0 | 5 | 10 | 0 | 3 |

Table 6. Opinion of different respondents on the current state of nature conservation along the Belgian coast. % signifies the percentage of respondents/group giving a specific response.

| Opinion on current state of Nature conservation | Politicians | Entrepreneurs | Naturalists | Inhabitants | Tourists | Total |
|--|-------------|---------------|-------------|-------------|----------|-------|
| | % | % | % | % | % | % |
| Good, but more necessary | 25 | 30 | 25 | 60 | 80 | 44 |
| Has improved over last 3 yrs | 70 | 65 | 50 | 10 | 0 | 39 |
| Sufficient | 0 | 0 | 0 | 30 | 15 | 9 |
| Bad | 5 | 15 | 25 | 0 | 0 | 9 |
| Needs active nature restoration ¹ | 5 | 0 | 30 | 10 | 0 | 9 |
| Lacks coordination | 20 | 10 | 5 | 5 | 0 | 8 |
| Apply structural plans ² | 20 | 5 | 5 | 5 | 0 | 7 |
| Need more financial and personnel support | 15 | 0 | 5 | 5 | 0 | 5 |
| Government's attitude towards nature conservation is slack | 10 | 0 | 15 | 0 | 0 | 5 |
| Don't know | 5 | 5 | 0 | 5 | 0 | 3 |

¹Restore Ijzer salt marsh, allowing sea transgressions, demolition of buildings in dunes, expropriation of dunes, etc.; ²i.e Coastal plan 1, Dune Decree.

Problems that respondents experienced personally in their activities on the coast were topped by mass tourism (22 %) and all its consequences such as environmental degradation, trampling, noise, vandalism, etc., mentioned particularly by inhabitants (30%) and tourists (35 %). The second most mentioned problem was traffic and parking problems (16 %), again most commonly mentioned by inhabitants and tourists (Table 9). Especially politicians (25 %) and naturalists (40 %) complained about the lack of finances and personnel in the execution of their tasks in the coastal zone as well as the lack of communication and coordination between

different levels of authority and between the coastal towns. Politicians (25 %) and entrepreneurs (25 %) found that the political processes and decisions went too slow, while inhabitants (25%) and tourists (10%) complained about the lack of recreation and security for kids. Other irritations mentioned were dog faeces, pollution of air and sea water and the building frenzy in the form of continued building on the dunes.

Respondents ($N = 100$) were asked to evaluate several issues with respect to the coastal zone on a scale of 1 to 5, with 1 = not and 5 = very important (Table 10). Most respondents (52%) gave little importance to fur-

Table 7. The effects that the current nature conservation policy is expected to have on various fields in the coastal zone, as expressed by five groups of respondents. Expected frequencies (in brackets) for a $R \times C$ contingency table are given.

| Effect of current Nature conservation policy on: | Politicians $N = 20$ | Entrepreneurs $N = 20$ | Naturalists $N = 20$ | Inhabitants $N = 20$ | Tourists $N = 20$ | Total $N = 100$ |
|--|-------------------------|---------------------------|-------------------------|-------------------------|----------------------|--------------------|
| Economy | | | | | | |
| Neutral | 3(8.6) | 2(8.6) | 11(8.6) | 15(8.6) | 12(8.6) | 43 |
| Positive | 8(4.4) | 7(4.4) | 5(4.4) | 1(4.4) | 1(4.4) | 22 |
| Negative | 3(4.0) | 7(4.0) | 0(4.0) | 3(4.0) | 7(4.0) | 20 |
| Positive and negative* | 6(2.6) | 2(2.6) | 4(2.6) | 1(2.6) | 0(2.6) | 13 |
| Neutral or negative | 0(0.4) | 1(0.4) | 1(0.4) | 0(0.4) | 0(0.4) | 2 |
| Social affairs | | | | | | |
| Neutral | 4(3.8) | 3(3.8) | 0(3.8) | 7(3.8) | 5(3.8) | 19 |
| Positive | 14(13.6) | 15(13.6) | 19(13.6) | 12(13.6) | 8(13.6) | 68 |
| Negative | 0(0.8) | 1(0.8) | 0(0.8) | 1(0.8) | 2(0.8) | 4 |
| Positive and negative* | 2(0.6) | 0(0.6) | 1(0.6) | 0(0.6) | 0(0.6) | 3 |
| Don't know | 1(1.2) | 0(1.2) | 0(1.2) | 0(1.2) | 5(1.2) | 6 |
| Ecology and environment | | | | | | |
| Neutral | 0(0.2) | 0(0.2) | 0(0.2) | 0(0.2) | 1(0.2) | 1 |
| Positive | 20(19.8) | 20(19.8) | 20(19.8) | 20(19.8) | 19(19.8) | 99 |
| Tourism | | | | | | |
| Neutral | 1(2.2) | 0(2.2) | 0(2.2) | 7(2.2) | 3(2.2) | 11 |
| Positive | 18(16.8) | 20(16.8) | 20(16.8) | 11(16.8) | 15(16.8) | 84 |
| Negative | 0(0.6) | 0(0.6) | 0(0.6) | 2(0.6) | 1(0.6) | 3 |
| Positive and negative* | 1(0.4) | 0(0.4) | 0(0.4) | 0(0.4) | 0(0.4) | 1 |
| Agriculture | | | | | | |
| Neutral | 10(8.0) | 6(8.0) | 10(8.0) | 10(8.0) | 4(8.0) | 40 |
| Positive | 5(2.2) | 0(2.2) | 2(2.2) | 2(2.2) | 1(2.2) | 10 |
| Negative | 5(3.2) | 2(3.2) | 4(3.2) | 3(3.2) | 2(3.2) | 16 |
| Don't know | 0(3.6) | 12(3.6) | 4(3.6) | 5(3.6) | 13(3.6) | 34 |

*Depending on the situation

Table 8. Opinion of different respondents on the Provincial Structural Plan for the coast.

| Opinion about Structural plan | Politicians % | Entrepreneurs % | Naturalists % | Inhabitants % | Tourists % | Total % |
|---------------------------------------|---------------|-----------------|---------------|---------------|------------|---------|
| Don't know the plan | 5 | 25 | 10 | 45 | 35 | 24 |
| Reasonably good | 25 | 40 | 30 | 0 | 10 | 21 |
| Not legally binding | 25 | 15 | 20 | 10 | 0 | 14 |
| Lacks nature/open space | 15 | 5 | 10 | 0 | 0 | 6 |
| Bad | 0 | 5 | 0 | 0 | 10 | 3 |
| Lacks detail | 10 | 0 | 5 | 0 | 0 | 3 |
| Needs better traffic and parking plan | 5 | 0 | 5 | 5 | 0 | 3 |
| Too late | 0 | 10 | 5 | 5 | 0 | 4 |
| Other | 10 | 0 | 15 | 0 | 0 | 5 |

ther economic and industrial expansion in the coastal zone, with 12% wanting better and more efficient use of the already existing economic structures. Matters such as sustainable exploitation of coastal resources, maintenance of carrying capacity of the coastal environment, increased faunal and floral biodiversity, unpolluted rivers and waterways and high quality of living each received the highest score from more than 80% of the respondents. Significant differences in median scores given to some of the above matters occurred between the respondent groups (Table 10). Tourists gave the lowest and inhabitants the highest median scores to quality of living (aesthetics, public health, pristine unpolluted environment, etc.) while entrepreneurs gave the highest and tourists the lowest importance to increased, but controlled and integrated, development of the tourist industry along the coast. Many respondents (36%), when confronted with the latter issue, requested recreational variety, especially 'all weather' and nature recreation.

When asked who was most responsible for the overdevelopment of the Belgian coastline and subsequent problems, 29% of the respondents declared the coastal municipalities most guilty (Table 11). In the second

place, politicians on all levels of authority (municipalities, Province West Flanders, Flemish Community and Federal government) were considered by 19% of the respondents to be most responsible. Estate agents and builders were considered most guilty by 16% of the respondents while 11% felt that everybody, including the public, had contributed equally to the problem. 7% of the respondents felt that mainly the higher authorities, i.e. not the municipalities, but the provincial, regional and federal ones were most responsible due to lack of control over the municipalities. 6% of the respondents were neutral.

The future vision of the Belgian coast desired by respondents generally encompassed the solutions to problems listed in Table 4 with the emphasis on nature conservation and restoration and coastal city renovation and greening. In addition, 6% of the respondents also hoped for protection of the architectural heritage that survived the building frenzy along the coast.

Table 9. Problems experienced personally (as opposed to general problems in Tables 2 and 3) by respondents active in the coastal zone.

| Problems personally experienced along the coast | Politicians % | Entrepreneurs % | Naturalists % | Inhabitants % | Tourists % | Total % |
|--|---------------|-----------------|---------------|---------------|------------|---------|
| Mass tourism ¹ | 15 | 15 | 15 | 30 | 35 | 22 |
| Traffic & parking problems | 0 | 5 | 0 | 45 | 30 | 16 |
| Lack: finances & personnel | 25 | 10 | 40 | 0 | 0 | 15 |
| Slow political processes | 25 | 25 | 10 | 5 | 0 | 13 |
| Lack of communication and coordination of authority ² | 20 | 15 | 20 | 0 | 0 | 11 |
| Lack of recreation for kids | 0 | 0 | 0 | 25 | 10 | 7 |
| Dog faeces | 0 | 0 | 5 | 5 | 20 | 6 |
| Pollution ³ | 0 | 5 | 5 | 10 | 10 | 6 |
| Building frenzy | 10 | 0 | 5 | 0 | 10 | 5 |
| Conflict of interests ⁴ | 15 | 0 | 5 | 0 | 0 | 4 |
| Bad nature conservation | 0 | 0 | 15 | 0 | 0 | 3 |
| No problems | 0 | 20 | 5 | 20 | 20 | 13 |

¹and all its consequences: environmental degradation, pollution, noise, vandalism, littering, trampling, etc.; ²between different levels of authority (federal, provincial and local) and between coastal towns; ³contamination of air, sea water and environment; ⁴nature vs. industry vs. tourism vs. harbours, etc.

Discussion

The great majority of respondents (80%) were of the opinion that the Belgian coast is overdeveloped and overcommercialized and 82% considered the lack of natural areas a serious drawback. Problems mentioned and solutions offered by the different groups were very similar although some of these were characteristic of specific groups. The desire for an immediate stop to construction in the dunes was almost unanimous, as was the need for conserving whatever open space/nature left in the coastal zone. Furthermore, a structural plan with legal power for the entire coast and strict application of structural plans and rules was deemed essential by all groups. Mass tourism and all its consequences, especially traffic congestion and parking problems, was also considered as one of the 10 most pressing problems by all five groups. Overall, respondents felt that nature conservation had improved over the last 3 years since a separate division 'Nature' for coastal conservation (formerly under the Forestry Division 'Bos & Groen') was created and a separate officer was appointed who could concentrate on this immense task (Herrier 1998). Most felt that more still had to be done for preserving the natural areas that still exist.

Apart from the similarities between groups for the most important problems and solutions, the cluster analyses showed differences between the respondent groups due to problems and solutions emphasized by or characteristic of specific groups (Figs. 2 and 3). Politicians (based on problems mentioned) were most different from the rest because they especially (but also naturalists) were aware of the lack of vertical and horizontal communication, coordination and cooperation between

different authorities, something that the other groups were less conscious of. Interestingly, problems mentioned by tourists and naturalists were most similar (Fig. 2) suggesting that tourists are well informed on coastal issues and are generally nature conservation oriented. Politicians and naturalists grouped together in a cluster based on solutions mentioned, demonstrating that naturalists were aware of political issues and limits to rectification of past mistakes, and *vice versa*.

Both politicians and naturalists disapproved of too much power in the hands of the municipalities. They also emphasized protection of the polders behind the dune strip and were more aware of the problem of dune water extraction than the other groups. Entrepreneurs wanted more investment in tourism and renovation of coastal cities by the government and the private sector. Especially inhabitants wanted more security and recreational variation for young people throughout the year. Naturalists suggested more governmental support for nature conservation in the form of personnel and finances. The majority of naturalists also desired recovery of functional ecosystems at sites where coastal defence would not be endangered, i.e. at the Zwin and Westhoek reserves and the Ijzer estuary.

Various methodological aspects, such as the limited number of respondents / group due to limited time and funds available, telephonic questioning, and the absence of a non-user group could influence the results of this paper. The so-called more neutral opinion of a non-user group is questionable, however, since during the pre-test it became apparent that non-users avoided the coast exactly because they were more negatively biased towards it. Selecting respondents from a telephone book may exclude those that have no telephone,

Table 10. Evaluation of the importance of several issues in the coastal zone. Percentage of respondents giving different scores (1 = not important; 3 = important; 5 = very important), i.e. 52 % of the respondents allocated a score of 1 to issue no. 1.

| Issues related to the coastal zone | Score | | | | | Differences between respondent groups in scores given Kruskal-Wallis + multiple comparison among medians test ² |
|--|-------|---|----|----|----|---|
| | 1 | 2 | 3 | 4 | 5 | |
| 1. Further economic and industrial expansion (controlled) ¹ | 52 | 6 | 28 | 6 | 8 | $H = 8.2$ (4, N = 101); $p = 0.08$ |
| 2. Maintenance of carrying capacity of coastal environment | 0 | 0 | 3 | 10 | 87 | $H = 9.1$, (4, N = 99); $p = 0.058$ Median score Inhabitants < Tourists |
| 3. Sustainable exploitation of coastal natural resources | 0 | 1 | 3 | 8 | 88 | $H = 8.3$ (4, N = 101); $p = 0.08$ |
| 4. High quality of living (esthetics, public health, pristine environment) in coastal zone | 0 | 0 | 5 | 16 | 78 | $H = 12.2$ (4, N = 99); $p = 0.015$ Median score Inhabitants highest |
| 5. Expansion of touristic industry (controlled, organised) ³ | 24 | 8 | 24 | 9 | 35 | $H = 18.3$ (4, N = 67); $p = 0.007^3$ Median score Entrepreneurs highest Median score Tourists lowest! |
| 6. More recreational variation (all weather) and nature recreation for tourists ³ | 0 | 0 | 17 | 8 | 75 | $H = 3.5$ (4, N = 36); $p = 0.47^3$ |
| 7. Increased biodiversity of coastal plants and animals | 1 | 1 | 6 | 8 | 84 | $H = 4.5$ (4; 101); $p = 0.35$ |
| 8. Unpolluted streams, estuaries, rivers, harbours | 0 | 0 | 0 | 3 | 97 | $H = 12.4$ (4, N = 101); $p = 0.015$ Median score Politicians lowest (4.85) |

¹12% wanted economic rationalization, increased efficiency and better use of structures already present; ²only done if Kruskal-Wallis was significant at $p = 0.05$; ³Issue 6 was a spontaneous response of 36 respondents when confronted with issue 5. Issues 5 and 6 could be combined ($N = 103$), but were separated to demonstrate the importance of providing more all recreational variety.

Table 11. The persons or groups from the past considered by different groups of respondents **most** responsible for the current problems along the Belgian coastline.

| Persons or groups from the past most responsible for coastal problems | Politicians % | Entrepreneurs % | Naturalists % | Inhabitants % | Tourists % | Total % |
|---|---------------|-----------------|---------------|---------------|------------|---------|
| Municipalities | 35 | 25 | 45 | 5 | 35 | 29 |
| Politicians (all levels ¹) | 15 | 25 | 10 | 25 | 20 | 19 |
| Estate agents + builders | 30 | 15 | 20 | 15 | 0 | 16 |
| Everybody | 5 | 15 | 5 | 15 | 15 | 11 |
| Government ² | 10 | 5 | 10 | 5 | 5 | 7 |
| Don't know | 0 | 0 | 0 | 20 | 10 | 6 |
| Tourism | 0 | 10 | 0 | 0 | 15 | 5 |
| Agriculture | 5 | 0 | 10 | 0 | 0 | 3 |
| Other ³ | 0 | 5 | 0 | 15 | 0 | 4 |

¹Municipalities, Province West Vlaanderen, Flemish Region and Federal government; ²All authority levels higher than municipalities; ³Second-home owners, industries.

but this is less important in the First World (where wealth is better distributed and most households have a telephone) as opposed to the Third World where this selecting method would constitute a marked socio-economic bias. Although not as ideal as a face-to-face interview, telephonic questioning was still preferable to a postal questionnaire survey because terms, such as 'sustainable exploitation', 'biodiversity', etc. could be explained and respondents could be encouraged to answer questions they were tempted to neglect or avoid. Statistical analyses were sometimes not possible due to low frequencies, thus, although differences between groups were strongly suspected, these could not be proved statistically.

As in many countries, e.g. the UK (Ballinger et al. 1996), Portugal (Granja 1996) and Australia (Kay & Alder 1995), the lack of integration in coastal management policies between authorities on different levels (Anon. 1993c) and between municipalities seems to lie at the base of the Belgian coastal problems. Typically, the coast is the shared responsibility of numerous agencies but the sole responsibility of none (Jones 1996). There exists no long-term integrated structural plan for the entire Belgian coast, resulting in duplication of facilities and mismanagement. Another stumbling block is limited application of the few existing management policies, even ones with legal power such as the Dune Decree. There are several instances where these policies are actively transgressed without penalty or prosecution. Hence, not only do 87% of the respondents hold past governments fully or co-responsible for the overdevelopment of the Belgian coast but even the present authorities enjoy little of the public's trust to improve the situation, as is clear from the widespread skepticism about the application of the Dune Decree, for instance. Furthermore, the general discontent with the Provincial structural plan for the coast demonstrates the necessity to allow all stake holders (all levels of authority, coastal experts, the tourist sector as well as the public) to participate even in the planning phases of coastal management

projects to assure optimum results (Sidaway 1995).

The role of nature in tourism is receiving increasing attention worldwide. The Belgian authorities have realized this and have changed their priorities from maximum tourist development in the 1980s to sustainable development of the tourist sector along the coast with emphasis on nature development and protection since 1990 (Kelchtermans 1990; Anon. 1995). Education of the public plays a big role in the current program aiming to harmonize tourism and nature conservation. However, some respondents felt that tourists are unresponsive to education, especially one-day tourists. The aim of the tourist sector is to increase the percentage of primary holidays, i.e. more-day tourism, on the Belgian coast (Anon. 1995). Modernization of coastal cities and increase of quality of recreational facilities combined with directed promotion of the Belgian coast are essential to combat the increasing competition from international holiday destinations. Renovation of old unused buildings for accommodation and beautification and greening of the old city centres is the aim. The ideal is that, as with the 'Green Globe' in the UK, the tourist sector gets involved in integrated coastal zone management to ensure sustainable tourism (Hawkins 1996).

The low scores for industrial and economic development on the coast despite the relatively high unemployment level there, and the high values for concepts such as 'sustainable development of coastal resources', 'increase of biodiversity', etc. reflect the environmental and ecological awareness of most respondents. They are also aware of the drawbacks of mass tourism and its consequences. The lack of natural areas was widely perceived and the current coastal nature conservation policy was generally expected to have a positive effect in the ecological, social, tourist and even in the economic sense. The problems perceived by all groups generally agreed well with those stated by planners, policy makers and researchers in the literature (Kelchtermans 1990; Bossu 1991; Anon. 1992b, 1993a; Seys et al. 1993; Herrier 1994, 1998; Baeteman 1995;

Provoost & Hoffmann 1996), although as expected, different groups emphasized different problems and solutions, but were well aware of most existing ones.

Politicians at all levels, but especially the coastal municipalities of the past, were held responsible for the overdevelopment of the Belgian coast. Many respondents feel that the slack policy and uninterested attitude of former higher authorities was responsible for the misuse of power and corruption by coastal municipalities. In their opinion, the coordination and integration of all levels of authority and strict application of a long-term structural plan for the coast in the past would have avoided the current problems. The perceived failure of strict application of rules and structural plans along the Belgian coast even today is reflected in the skepticism of respondents as to the future actualization and positive effect of the Dune Decree or the current structural plan.

11% of the respondents felt that everybody was responsible for the overdevelopment of the Belgian coast and that it was a natural evolution after the Second World War. It has to be taken into consideration that in Belgium, the ratio of length of coastline to land area is 0.3, a low figure for the European Union (Anon. 1997). Furthermore, the 10 million Belgian inhabitants (not including the many Dutch, French and German tourists) only have 65 km coastline to their disposal, which equates to more than 153 800 inhabitants/km². This is very high compared to e.g. 16 300 inhabitants/km coast in France (57 million French with a coastline of 3427 km), ca. 8000 inhabitants/km² in Spain and 4580 inhabitants/km² in the United Kingdom (Miller & Auyong 1991). Similar stretches of overdeveloped coastline exist in these countries, but because the tourist pressure is less concentrated on their relatively longer coastlines, more natural parts remain. Furthermore, assuming that the coast is the most popular recreational area in Belgium, as in Australia (Houghton 1989), South Africa, (Moffett & De Ruycck 1995) and many other countries in Europe (Gubbay 1994), the high pressure on the Belgian coast can be understood. While in several countries most people live in the coastal zone, e.g. 50% in Sweden (Anon. 1997), 51% in Ireland, 60% in Greece, 70% in Denmark, 75% in Norway (Gubbay 1994) and > 80% in Australia (Houghton 1989), this is fortunately not the case in Belgium. Otherwise the coastal problems would have been even more severe.

Recreational variation for all weather conditions and nature recreation was mentioned frequently by all groups except tourists. It is clear that most tourists visit the coast mainly for the sea, beach and exciting recreational facilities and activities and to a lesser extent for enjoying nature (De Ruycck et al. 1995, 1997). Nevertheless, like the other groups, tourists also felt that even more has to be done in terms of nature conservation along the

coast. This attitude, together with the low demand for nature and all-weather recreation displayed by tourists are therefore surprising and contradicting. This may be explained if most of the respondents in the tourist group were one-day tourists that mostly visit the coast when good weather is predicted. They use the beach for recreation and have less need for 'bad weather' or nature recreation alternatives than the more-day tourists who encounter both bad and good days during their prolonged coastal visit. More recreation facilities with higher carrying capacities than dunes will release the tourist pressure on dunes.

Coordinated multidisciplinary research to find the causal relationships between biotic and abiotic factors is essential for integrated coastal management, based on sound scientific knowledge (Provoost & Hoffmann 1996; Burbridge & Humphreys 1999; Dronkers & de Vries 1999). However, it is clear that scientific information about the coast is neither sufficiently available nor understandable to the layman. To obtain the public's cooperation and respect for nature and appreciation for the efforts of the authorities towards nature conservation, it is crucial that the tourist sector gets involved in integrated coastal zone management (Hawkins 1996) and that tourists are educated. Chan (1970) has shown the benefits of public and school educational field trips on a marine environment. Since this is more difficult with one-day tourists, education has to be done in innovative ways to attract attention and make permanent impressions. To this end, excellent use could be made of television programs and other media to reach potential tourists, preferably before they even reach the coast. Foreign tourists should be educated by information boards, education centres and even pamphlets deposited in their holiday accommodation. It is important that authorities realize that sufficient funds should be made available for tourist education since no integrated management policy will have satisfactory results as long as the cooperation of tourists and public is lacking.

Coastal municipalities are held responsible for the mismanagement and overdevelopment of the Belgian coast. Many respondents also blame higher authorities for lack of control and supervision over the municipalities in the past to ensure an integrated development of the coastal zone. These two points should serve as a warning for developing countries, such as South Africa, Brazil and Chile where the need for development of the tourist sector is a strong driving force for possible overdevelopment of their coasts. Furthermore, where there is the tendency to delegate a considerable amount of power and decision-making to the local authorities, as is the case in, e.g. South Africa, the danger becomes even greater if there is no vertical and horizontal coordination between authorities or an overriding body super-

vising these decisions. The most efficient system would be one managing body with an advising committee of ecologists, geomorphologists and other scientists plus representatives of municipalities, always with voluntary consultation and participation of all groups involved as well as the public (Jones 1996; Anon. 1999). Examples are the 'Milford Haven Waterway Environmental Monitoring Steering Group' in Wales, UK (Morgan et al. 1996) and the 'Specialized Enterprise for Research and Construction Baltberegozashita' (SNPO) in the Kalingrad region, Russia (Boldyrev et al. 1996). However, although background knowledge is often available, legislation is usually lacking (Boldyrev et al. 1996). To enforce sound integrated management policies, new legislation has to be formulated and existing ones amended or discarded if not applicable anymore. Especially in the case of coastal development, developing countries should learn from the mistakes made and problems experienced by developed countries. It is hoped that with this information coastal developers can learn from the pitfalls and problems that result from unbridled and unplanned development.

Conclusions

Most Belgians agree that their coastline is over developed and generally feel the lack of natural areas as a disadvantage. Lack of integration in coastal management policies between authorities at different levels and between different municipalities seem to be of greatest concern. A long-term integrated structural plan for the entire 65 km stretch of Belgian coast, with legal power, will rule out duplication of facilities and mismanagement of the coast and dunes. It is essential that management policies, such as the Dune Decree should be strictly applied with severe penalties for transgressions. Without the above-mentioned four prerequisites (coordination and communication between all authorities involved, a long-term structural plan integrating the entire coast, with legal power to enforce, and strict application of rules and policies) no integrated coastal zone management plan for the Belgian coast will have any positive effect, neither stem the disintegration of the coastal environment under the immense pressures exerted. Mass tourism and its consequences are recognized by many as another destructive force in the coastal zone. Therefore, vigorous and innovative measures have to be taken to educate tourists and create love and respect for nature. Coordinated multidisciplinary research is critical for integrated nature management based on sound scientific knowledge, but this knowledge has to be conveyed to the layman in an understandable form to obtain their cooperation in preserving the coastal environment.

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References

- Anon. 1991. *Zeewerende duinen – niet alleen zeewering*. A report by the Coastal Harbours Service of the Department of the Environment and Infrastructure, Vlaams Gewest, Brussels.
- Anon. 1992a. *Structuurplan, Kustzone. Deel I: Analyse van de bestaande toestand en evolutie*. WES, Brugge.
- Anon. 1992b. *Structuurplan, Kustzone. Deel II: Knelpunten, prognoses en behoeftebepaling*. WES, Brugge.
- Anon. 1992c. *Structuurplan, Kustzone. Samenvattend Rapport*. WES, Brugge.
- Anon. 1992d. *Annual report 26*. Westtoerisme, Brugge.
- Anon. (Administratie Waterinfrastructuur en Zeewezen). 1993a. *Kust 2002, Deel 1. De Zeewerende functie van de kust. Stand van zaken*. Preliminary report of the Flemish Community, Dept. of Environment and Infrastructure, Brussels.
- Anon. 1993b. *Statistica for Windows*. Release 4.2. Statsoft Inc., Tulsa, OK.
- Anon. 1993c. *Coastal zone management: Integrated Policies*. OECD Publication Services, Paris.
- Anon. (Natuurreservaten vzw & WWF) 1994, 1999. *Tien punten-programma voor integraal kustzonebeheer in België*. Paper presented at the symposium 'Kustdag – Tussen Land en Zee' at De Haan, June 1994.
- Anon. 1995. *Toerisme Vlaanderen: visie op toerisme in Vlaanderen 1995-2000*. Toerisme Vlaanderen, Brussels.
- Anon. (European Commission) 1997. *Better management of coastal resources*. Office for Official Publications of the European Communities, Luxembourg.
- Anon. 1999. *Lessons from the European Commission's demonstration programme on integrated coastal zone management*. Office for Official Publications of the European Communities, Luxembourg.
- Baeteman, C. 1995. De conflictsituatie tussen natuur en toerisme in het kustgebied. *De Aardrijkskunde* 3: 5-20.
- Ballinger, R.C., Havard, M., Pettit, S. & Smith, H.D. 1996. Towards a more integrated management approach for the Welsh coastal zone. In: Jones, P.S., Healy, M.G. & Williams, A.T. (eds.) *Studies in European coastal management*, pp. 35-44. Samara Publishing, Cardigan.
- Boldyrev, V.L., Ryabkova, O.I. & Shelkov, I.A. 1996. The role of SNPO Baltberegozashita in coastal protection along the Baltic sea coast of the Kalingrad Region. In: Jones, P.S., Healy, M.G. & Williams, A.T. (eds.) *Studies in European coastal management*, pp. 101-103. Samara Publishing, Cardigan.

- Bossu, P. 1991. Het ruimtelijk wanbeleid aan de Vlaamse Kust. *Panda (WWF)* 41: 20-21.
- Burbridge, P. & Humphrey, S. 1999. On the integration of science and management in coastal management research. *J. Coastal Conserv.* 5: 103-104.
- Carter, R.W.G. 1988. *Coastal environments: an introduction to the physical, ecological and cultural systems of coastlines*. Academic Press, London.
- Chan, G.L. 1970. *Analysis of the effects of public and educational school field trips on a marine environment, Duxbury Reef*. Ph.D. Thesis, University of California, Berkeley, CA.
- De Pue, E., Lavrysen, L. & Stryckers, P. 2000. *Milieuzaakboekje 2000 – Leidraad voor de milieuwetgeving in Vlaanderen*. Kluwer, Antwerpen.
- de Ruig, J.H.M. 1998. Coastline management in The Netherlands: human versus natural dynamics. *J. Coastal Conserv.* 4: 127-134.
- De Ruyc, A.M.C., Soares, A.G. & McLachlan, A. 1995. Factors influencing human's beach choice on three South African sandy beaches: a multivariate analysis. *Geojournal* 36: 345-352.
- De Ruyc, A.M.C., Soares, A.G. & McLachlan, A. 1997. Human recreation patterns on beaches with different levels of development. *Trans. R. Soc. S. Afr.* 52: 257- 276.
- Dronkers, J. & de Vries, I. 1999. Integrated coastal management: the challenge of transdisciplinarity. *J. Coastal Conserv.* 5: 97-102.
- Fabbri, P. 1990. *Recreational uses of coastal areas*. Kluwer, Dordrecht.
- Goeldner, L. 1999. The German Wadden sea coast: reclamation and environmental protection. *J. Coastal Conserv.* 5: 23-30.
- Granja, H.M. 1996. Some examples of inappropriate coastal zone management in Northwest Portugal. In: Jones, P.S., Healy, M.G. & Williams, A.T. (eds) *Studies in European coastal management*, pp. 121- 128. Samara Publishing, Cardigan.
- Gubbay, S. 1994. Recommendations for a European Union coastal strategy. *Coastline* 1994 (3):16-29.
- Hawkins, R. 1996. Green Globe: a new approach to environmentally responsible tourism. In: Jones, P.S., Healy, M.G. & Williams, A.T. (eds) *Studies in European coastal management*, pp. 75-80. Samara Publishing, Cardigan.
- Herrier, J.-L. 1994. *Het Duinendecreet en de ruimtelijke ordening aan de kust*. Paper delivered at the symposium 'Kustdag – Tussen land en zee' at De Haan, June 1994.
- Herrier, J.-L. 1998. An ecosystem-perspective for the Flemish coast. *Coastline* 1998 (3): 27- 29.
- Herrier, J.-L. & Killemaes, I. 1998. Acquisition and protection of the coastal dunes of Flanders. *Coastline* 1998 (4):10-15.
- Herrier, J.-L. & Thomas, K. 1995. The Belgian coast: first steps towards an integrated coastal zone management. In: Healy, M.G. & Doody, J.P. (eds.) *Directions in European coastal management*, pp. 375-382. Samara Publishing, Cardigan.
- Houghton, D.S. 1989. Some aspects of beach use in the Perth metropolitan area. *Austr. Geograph.* 20(2): 173 -184.
- Jones, S. 1996. A comparative analysis of coastal zone management plans in England and the Netherlands. In: Jones, P.S., Healy, M.G. & Williams, A.T. (eds) *Studies in European coastal management*, pp. 45-56. Samara Publishing, Cardigan.
- Kay, R. & Alder, J. 1995. Recent initiatives in coastal planning and management in Australia. In: Healy, M.G. & Doody, J.P. (eds) *Directions in European coastal management*, pp. 415-424. Samara Publishing, Cardigan.
- Kelchtermans, T. 1990. *Gemeenschapsminister van Leefmilieu, Natuurbehoud en Landinrichting. Milieubeleidsplan en Natuurontwikkelingsplan voor Vlaanderen voor 1990-1995*. Ministry of the Flemish Community, Brussels.
- Maes, F. & Cliquet, A. 1996. *Het Belgisch beleid inzake de bescherming van de Noordzee*. Department of International Public Law, University of Ghent, Ghent.
- Maes, F. & Cliquet, A. 1997. *Het internationaal en nationaal recht inzake de bescherming van de Noordzee*, pp. 83-157. Kluwer Rechtswetenschappen, Antwerpen.
- Meur-Ferec, C. 1995. The role of territorial departments in the conservation of French coastal sites. In: Healy, M.G. & Doody, J.P. (eds.) *Directions in European coastal management*, pp. 383-390. Samara Publishing, Cardigan.
- Miller, M.L & Auyong, J. 1991. Coastal zone tourism - a potent force affecting environment and society. *Marine Policy* March 1991: 75-99.
- Moffett, M. & De Ruyc, A. 1995. *Beaches as recreational outlets – a national questionnaire survey*. SAB Institute for Coastal Research Report 37, University of Port Elizabeth, Port Elizabeth.
- Morgan, C.I., King, G.A.D. & Evans, S.B. 1996. Environmental management in Milford Haven: an integrated approach. In: Jones, P.S., Healy, M.G. & Williams, A.T. (eds) *Studies in European coastal management*, pp. 281-292. Samara Publishing, Cardigan.
- Provoost, S. & Hoffmann, M. 1996. *Ecosysteemvisie voor de Vlaamse Kust. II Natuurontwikkeling. Report by AMINAL: section Nature, Brussels*. University of Ghent and Institute voor Natuurbehoud, Brussels.
- Seys, J., Meire, P., Devos, K. & Kuijken, E. 1993. *De Kust- en Vlaamse Banken: ecologisch belang, raakvlakken met andere functies en beheersuggesties*. Conceptrapport. Institute for Nature Conservation, Hasselt.
- Sidaway, R. 1995. Recreation and tourism on the coast: managing impacts and resolving conflicts. In: Healy, M.G. & Doody, J.P. (eds) *Directions in European coastal management*, pp. 71-78. Samara Publishing, Cardigan.
- Siegel, S. & Castellan, N.J. 1988. *Nonparametric statistics for the behavioural sciences*. 2nd. ed. McGraw-Hill, Singapore.
- Sokal, R.R. & Rohlf, F.J. 1995. *Biometry*. W.H. Freeman, San Francisco, CA
- Zar, J.H. 1984. *Biostatistical analysis*. 2nd. ed. Prentice-Hall International, Englewood Cliffs, NJ

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