WALTER
wadden sea
LONG-TERM ECOSYSTEM RESEARCH

Sound, innovative and connective monitoring
for the Wadden Sea area

INDICATORS OF SOCIOECONOMIC DEVELOPMENT IN THE DUTCH WADDEN AREA

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1 INTRODUCTION

This report is part of the activities performed within the frame-work of the 'Wadden Sea Long-term Monitoring Ecosystem Research (WaLTER)' project, which is funded by the Dutch Waddenfonds and by the Provinces of Noord-Holland and Fryslân (www.walterproject.nl). WaLTER is an initiative of a number of institutes and organizations involved in research and long-term monitoring in the Wadden area. WaLTER is aimed to deliver a framework for long-term monitoring of both the ecology and the socioeconomy of the Dutch Wadden area, based on best practices. The ultimate goal of the project is to increase insight in the functioning of the Wadden area's ecosystem and its socioeconomic system, and to support future research and management efforts.

This report is aimed to contribute to the understanding of the Wadden area's socioeconomy. A robust long term monitoring framework for the Wadden area ideally builds on a sound knowledge-base of the socioeconomic system and an understanding of how the system's functioning in the Wadden area is distinctive. Often this requires insight in processes that exceed the spatial scale of the Wadden area, since these may have a significant impact on developments in the Wadden area. This both general and Wadden-specific theoretical base can be used to derive meaningful indicators for socioeconomic development in the Wadden area.

The report is structured as follows. First several key socioeconomic conceptual models are discussed in a specific format: on each left-hand side page a core description of a key model is provided, followed by an elaboration of its parts and theoretical grounds, a discussion of its limitations. On each right-hand side page an interpretation of the model is provided within the context of the Wadden area, followed by a list of indicators derived from the model that are deemed relevant to long term monitoring of the Wadden area. In Chapter 3, key integrative conceptual models are discussed in the same format as described above. Next, empirical issues in indicator definition are discussed. Chapter 5 focusses on project and policy evaluation practices relevant to the identification and specification of socioeconomic indicators. Chapter 6 builds on insights from previous chapters as it discusses the use of a Spatial Economic Ecologic Database (SEED), and a synthesis is provided in Chapter 7.

1.1 Spatial definition of the Dutch Wadden area

This report concerns the Dutch Wadden area, which we define as the Wadden Sea and all adjacent municipalities – see figure 1. We acknowledge that municipal borders are subject to temporal change and use this definition as a practical solution for defining borders of the Wadden area. Municipal borders are nevertheless meaningful since local government has a strong influence on the management of the Wadden area. Furthermore, we approach the Wadden area as a rural area as defined in Terluin (2003) as the area comprises several small or medium-sized cities surrounded by large areas of open space and the region's economy consists of mainly agricultural, industrial and services activities while the population density is relatively low.

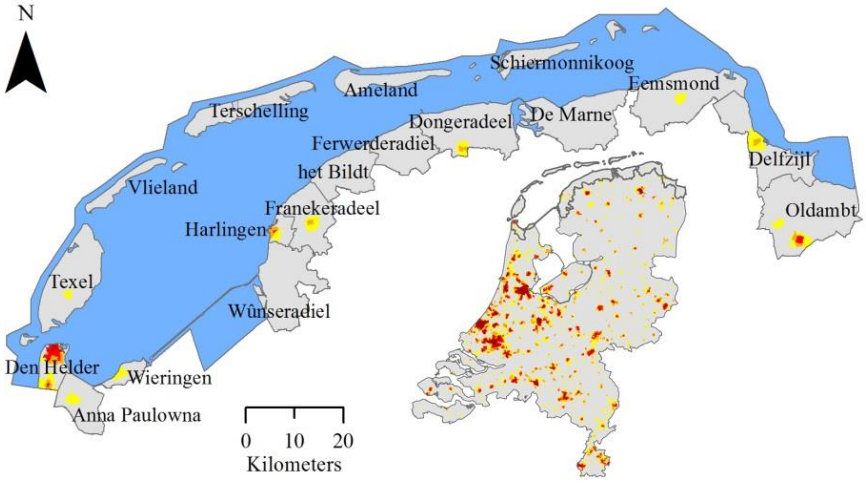

Figure 1. positioning of the Wadden area within the Netherlands, Wadden municipalities, and degree of urbanization in 2010 (Source: The Netherlands' Cadastre, Land Registry and Mapping Agency / Statistics Netherlands)

2 KEY SOCIOECONOMIC CONCEPTUAL MODELS

2.1 Regional economy: a basic model by Armstrong & Taylor

2.1.1 Summary

What is it about?

Key components that a regional economy consists of are the product market and the labor market. Figure 2 illustrates the interaction between both markets. It shows that employment growth depends on the growth of output, which can be physical or monetary, of the regions industries. The level of competitiveness of the industries involved in production is the main determinant of growth (Terluin, 2003).

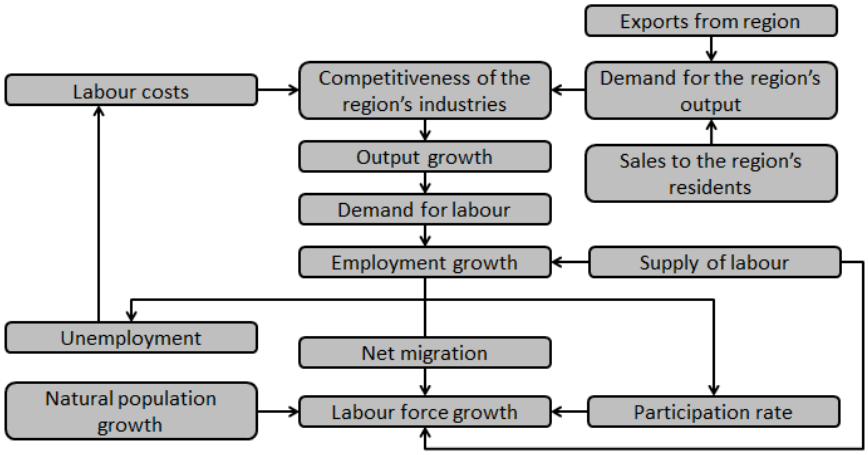

Figure 2. A regional economy (Source: Armstrong & Taylor, 1993, p.139)

Further explanation

Growth of a region's output will be highly dependent upon its level of competitiveness compared to other regions competitiveness. At its simplest, the competitiveness of a region's industries is essentially the success with which these industries compete with both each other and other region's industries in some way (Kitson et al., 2004). Storper (1997, p.20) extends competitiveness to 'place competitiveness', which he defines as "the ability of an (urban) economy to attract and maintain firms with stable or rising market shares in an activity while maintaining or increasing standards of living for those who participate in it." Regions which possess highly competitive industries are likely to experience higher output and employment growth than regions with less competitive industries – unless there are constraints on the highly competitive region's output growth. Whether a region with a high demand for its output will grow accordingly, however, is critically dependent upon its ability to obtain the necessary inputs. In the short term, regions may be severely supply-constrained and may not be able to respond quickly to an increase in demand for their output. Such constraints are less likely to operate in the medium to long term because of interregional factor mobility. The usual short-run response of a region to an increase in demand for labor is for new recruits to be taken from the pool of unemployed workers. A further source of additional workers is an increase in the participation rate. An important mechanism that allows for additional workers to be obtained is interregional labor migration. If output growth hits supply constraints, the consequent excess labor demand leads to increased labor costs as employers compete for scarce labor and as the bargaining power of workers in wage negotiations increases. This inevitably has adverse effects on competitiveness unless productivity can be improved to offset the increase in labor costs.

Criticism and limitations

The model discussed in this section is rather basic which detracts from the use of detailed criticisms . It provides an informative conceptual sketch of regional economic structure. However, it should be noticed that in the model 'growth' is mentioned every time when a change in the economic state of the region is described. In contrast to the tendency in classical theory of regional economic development it can be useful to consider that the values of determinants of development can also be negative or neutral.

2.1.2 Applicability within WaLTER

Explorative interpretation for the Wadden area

The Wadden area's economy has changed over the past decades. Rural-economic sectors that traditionally where strong, including the agricultural and industrial sector have been outgrown by the service sector. Figure 3 shows differentiation in the size of rural-economic sectors among Wadden municipalities in 2009. Clearly, economies at the isles are relatively small overall, while some mainland economies (e.g. Delfzijl) include a strong industrial or service (e.g. Den Helder) component. Note that the service sector in Den Helder (indicated in the figure using *) far exceeds the size of the total economies of the other Wadden municipalities. This is mainly due to the naval base which is the main driver of the local economy. Economies have become less localized over time as many inhabitants of the Wadden area now commute to work in the cities of Leeuwarden and Groningen. These employment centers are however located external to the Wadden area. The labor market and similarly the market for the region's outputs are essentially regional systems.

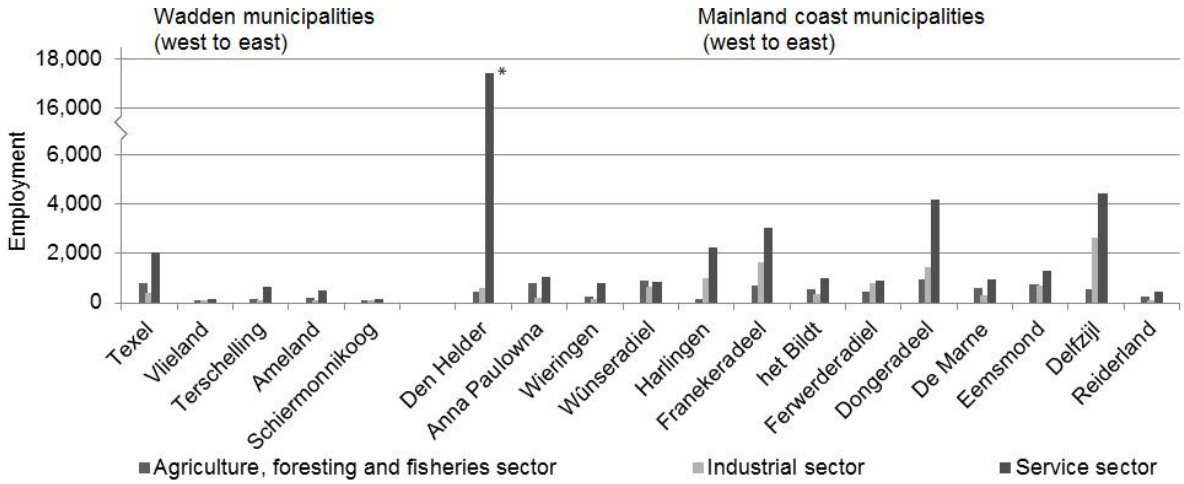

Figure 3. Employment in rural-economic sectors in Wadden municipalities in 2009 (Source: LISA)

Possible variables for Wadden area monitoring

Indicator
Labor costs
Unemployment
In-migration by origin
Out-migration by destination
Natural population growth
Labor force
Labor participation rate
Exports by destination
Output (regional GDP)
Number of firms
Employment

Further reading

Armstrong, H. & Taylor, J., 1993. *Regional Economics and Policy*, 2nd Edition. Harverster Wheatsheaf, Hemel Hempstead.

Kitson, M., Martin, R. & Tyler, P., 2004. Regional competitiveness: an elusive yet key concept? *Regional Studies* 38, 991-999.

Terluin, I., 2003. Differences in economic development in rural regions of advanced countries: an overview and critical analysis of theories. *Journal of Rural Studies 19*, p.327-344.

2.2 Economic base theory

2.2.1 Summary

What is it about?

The economic base model builds on the idea that external demand for a region's goods and services is the primary driver of economic development (Blumenfeld 1955). A region's economy comprises two sectors, a basic and a non-basic sector. According to the literature, the basic sector typically comprises activities in agriculture, forestry and fisheries, while the non-basic sector is considered to include activities in manufacturing, wholesale, or producer services. The basic sector produces goods and services that are exported to other regions while the non-basic sector produces goods and services that serve the needs of the region's inhabitants.

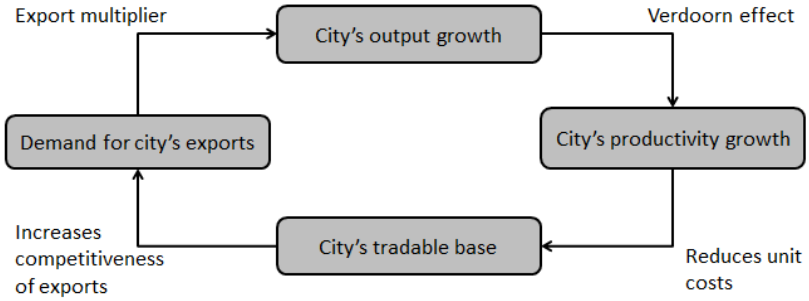

Figure 4. Conceptualization of the economic base model

Further explanation

Economic development in this Keynesian model is fueled by demand-driven dynamics. At the core of these dynamics are two relations between the basic and the non-basic sector. First, firms in the basic sector buy goods and services from non-basic sector firms; and second, people employed in the basic sector buy goods and services that are produced by non-basic sector firms. Consequently, several multiplier effects are included in this regional economic model. For instance, an increase in the level of production in either the basic and the non-basic sectors may result in higher demand for labor, which indirectly elevates consumption from the non-basic sector as more incomes can be spent on the non-basic goods due to the inflow of new laborers. Another distinctive feature of the economic base model is the 'Verdoorn effect' – see figure 4 – which refers to productivity growth as a result of further division of labor following production growth.

Criticism and limitations

A major criticism of economic base theory is the absence of assumptions regarding constraints on growth, thus neglecting the potential of an insufficient availability of production factors, infrastructure or residential properties which support economic growth. Another criticism is that the allocation of different sectors within a regional economy to either the basic or the non-basic sector is a rather arbitrary process: benefits from exports may be concealed by horizontal integration of firms as production inputs which these firms buy locally are attributed to the non-basic sector. The model can be used in short term forecasting applications of economic growth, if (1) the composition of the basic sector does not fluctuate substantially; (2) non-basic sectors remain competitive within the local economy; and if (3) local development is determined by external demand for a region's goods and services (Malizia & Feser, 1999).

2.2.2 Applicability within WaLTER

Explorative interpretation for the Wadden area

An obvious example of a basic sector in the Wadden area is the tourism sector. This sector exports goods and services, e.g. the joy derived from walking through an attractive natural landscape or a painting of the Wadden, to visitors. The employment and income generated by tourism firms generate additional sales in the non-basic sector, including grocery stores and providers of services, serving both tourists and the local labor force's needs. Insight in spatial differentiation in the competitiveness of the tourism sector can be derived from two main indicators. The first is a measure of economic specialization, the location quotient (LQ) specified as

$$LQ = (ei/e)/(Ei/E) \quad (1)$$

where LQ describes the outcome of the share of the tourism sector i in a region's total economy e divided by the share of the tourism sector i in the total economy E at the national level, which serves as a reference. The relative degree of an area's specialization is given by the location quotient's deviation from 1. An LQ>1 indicates that the sector in the area observed is exporting, and thus is a basic sector.

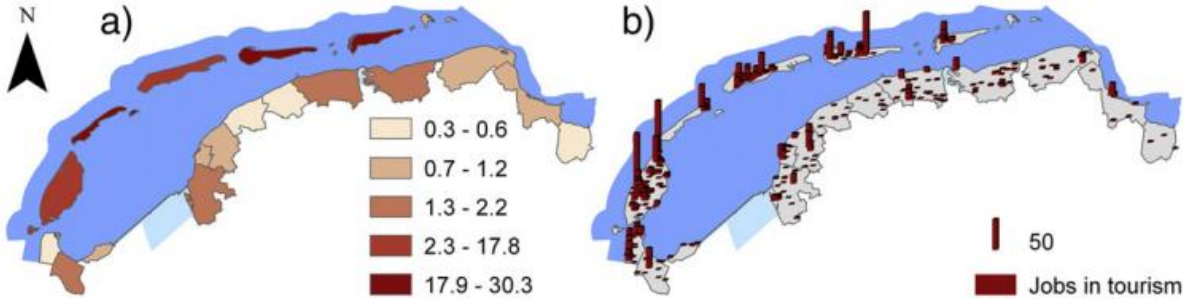

Figure 5. a) Location quotients for Wadden municipalities in 2010; b) employment in the tourism sector at firm level in 2010 (Daams & Sijtsma, 2013)

Figure 5a shows that it are mainly the Wadden isles where prosperity is driven by the tourism sector while several mainland municipalities show a far lower performance. The contrast between the mainland and isles is also apparent from figure 5b. However, it should be noted that the level of economic specialization and the absolute level of employment do not always match in their relative size when compared across municipalities. Therefore these indicators should be interpret within the context of each other, since an area highly specialized in tourism may have a very low employment level; or, a tourism sector which is relative high employment-wise may contribute little to the overall economy of an area and thus have little importance in the direction in which a local economy develops.

Possible variables for Wadden area monitoring

Indicator
Sectoral exports
Sectoral imports
Sectoral output
Sectoral productivity - capital in production - labor in production
Sectoral employment

Further reading

Malizia, E.E. & Feser, E.J., 1999. *Understanding local economic development*. New Brunswick, New Jersey: Center for Urban Policy Research, The State University of New Jersey.

Capello, R., 2007. *Regional economics*. New York: Routledge.

2.3 Neoclassical growth

2.3.1 Summary

What is it about?

Neoclassical growth models describe a regional economy existing of one sector, or two sectors. Economic development is defined by an increasing growth of output per capita. Such growth can be a result of technological progress, capital stock growth, and labor force growth. Neoclassical models describe how the process of growth results in the converging of productivity growth and wage differentials across regions.

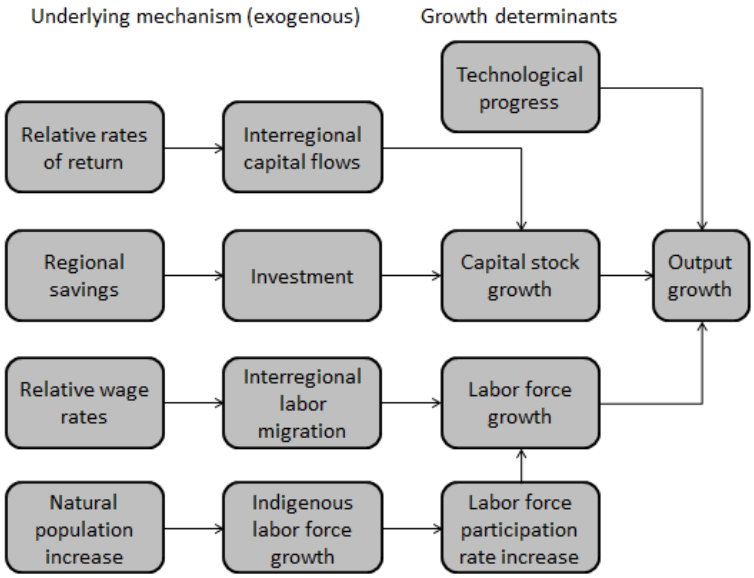

Figure 6. Neoclassical model (Source: adapted from)

Further explanation

The neoclassical model is based on theoretical foundations related to the economic base theory and Post-Keynesian theories of growth. It focusses on the demand side of economic development. The underlying rationale is that individuals behave as a rational 'economic man' would, by maximizing their utility while firms maximize their profits. The model connects growth of economic output, be it in either a financial or a physical sense, to development. Development is usually defined as a qualitative increase in the quality of life.

Criticism and limitations

The neoclassical growth model has been subject to extensive debate. The model builds on a set of questionable assumptions, including the following: the stock of inputs for production is unlimited and can be substituted by technology; technological advances are available everywhere directly; interregional reallocation of capital and labor depends solely on differences in the prices of factors of production; wage rigidity better explains regional unemployment being constant than demand-shortages; and constant returns (Capello, 2007). Furthermore, potential demand-shortages arising from unemployment are neglected. Also, the rationale that an increase in consumption corresponds with an increase in quality of life can be questioned for growth of consumption may exert a negative influence on both social and ecological systems (Gowdy & Erickson, 2005). Neoclassical growth models are mainly focused at the efficient allocation of raw materials, and are less focused on the spatial allocation and scale of regional economies compared to regions ecosystems (Daly & Farley, 2004; Gowdy & Erickson, 2005). Negative externalities of production on the environment lower positive externalities. Nevertheless, the utilization of the natural environment can be brought to a level that is sustainable in the long run, by setting the correct prices for production processes' external impacts (Illge & Schwarze, 2009). Hence, Gintis (2000) suggests that empirical studies support a novel direction for neoclassical welfare theory, in line with the theory's classical roots, which builds on a broader conception of value. This is important, for example, as empirical studies using the contingent valuation technique show that preferences for many environmental features are not subject to trade-offs. Moreover, "results from behavioural economics and psychology indicate the existence of endowment effects (people place higher values on things they already possess),

hyperbolic discounting (people discount the near future at a higher rate than the distant future), loss aversion (people are significantly more averse to taking a loss than failing to receive an equal gain), the part-whole problem (people consistently place higher values on the sum of individual components of an object of utility than on the whole thing itself) and many other 'anomalies' in consumer choice theory" (Gowdy & Erickson, 2005, p.212).

2.3.2 Applicability within WaLTER

Explorative interpretation for the Wadden area

This interpretation of the neoclassical model for the Wadden area focusses at the relation between population development and output growth. The first factor is the natural population increase, which in Wadden municipalities approximates the national average of 46,3 live births per 1,000 women of 15-50 years old in 2012, resulting in little differentiation between municipalities' indigenous labor force growth[1]. A higher impact on the regional labor force size is exerted by migration, as especially young people tend to leave the rural periphery, and the remaining potential labor force's participation rate. In the period of 2010-2012 labor force participation rate[2] does however show higher differentiation across municipalities, ranging from 58,8% in Harlingen to 69,8% in Hollands Kroon[3]. Interestingly, the share of the potential labor force in the total population is relatively high in Harlingen (76,4%) compared to Hollands Kroon (66,0%) (and even more when compared to the island of Texel which has a share of 51,9%). Besides the participation rate, the size of the labor force is also driven by interregional labor migration, which may among be caused other factors by regional differences in wages. Within the Wadden area, relative high wages (2000-2005) have been observed in the NUTS3-regions of Groningen and Delfzijl (Groot et al., 2011). These regions are examples of attractors of commuters; this commuting mechanism emphasizes that the size of the local labor force in rural areas is not necessarily a key determinant of output growth as suggested by the neoclassical model in figure 6. If however a labor force declines, its downward effect on output growth may be compensated by increased productivity per worker.

Possible variables for Wadden area monitoring

Indicator
Regional GDP
Labor productivity
Wage level
Natural population
Indigenous labor force
Migration
Investment
Interregional capital flows
Regional savings
Relative rates of return
Technological progress: - Capital intensity - Patents - R&D expenditures
Capital stock
Labor force
Labor force participation rate
Output

Further reading

Capello, R., 2007. *Regional economics*. New York: Routledge.

[1] Source: Statistics Netherlands (2014) *Geboorte; kerncijfers vruchtbaarheid, leeftijd moeder (31 december), regio*.
[2] Defined here as the share of employed inhabitants in the potential labor force (inhabitants aged 15-65).
[3] Source: Statistics Netherlands (2014) *Beroepsbevolking, gemeenten*.

2.4 Bid rent

2.4.1 Summary

What is it about?

The bid rent theory refers to how the price and demand for land change with distance to the city-center (Alonso, 1964). The price of land arises from competition between different types of land users, and is set by the buyer able to make the highest bid who then determines the land-use.

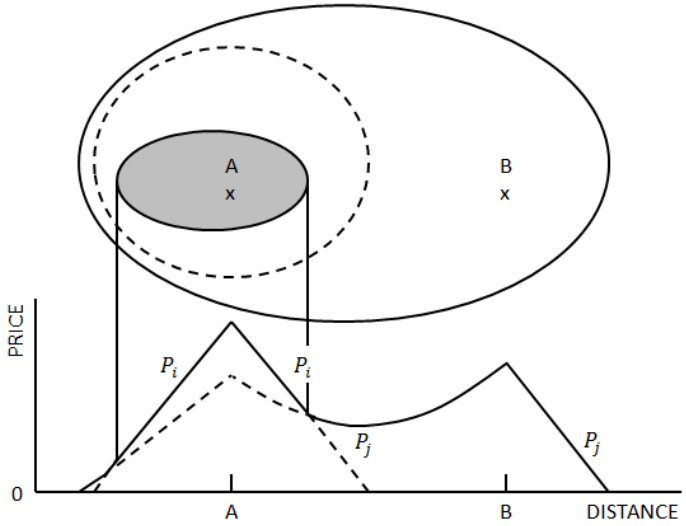

Figure 7. "A possible rent and occupancy pattern for two complementary centers: an island of high-income population" (adapted from Alonso, 1964, p.139)

Further explanation

The work by Alonso (1964) is regarded as the theoretical basis for the bid rent model, but the bid rent model also has neoclassical roots. Ricardo (1817) theorizes how land rent levels are based on the agricultural productiveness of the particular plot, based on relative soil quality, compared to the least productive plot. Rent is determined through competition among farmers for quality land. Von Thünen expanded this model by including transportation costs: the rent of land would equal the value of production minus the costs of production and transport to the market. From Alonso's (1964) bid rent theory it follows that in a monocentric city rent is highest in the city center, resulting in high-density development, and that rent will decline with distance from the city center to compensate for the cost of transportation, resulting in development at a lower density. Every bidder has its own bid price curve which represents a given utility level. Besides rent and transportation costs the costs of consuming other goods are also considered in the determination of the budget for the bid. Bidders from several segments, including the commercial, residential and industrial segment are considered. Since the commercial bidders may often have a need for locating near the 'marketplace' and have the financial means to make high bids for land the commercial sector is often dominant in city centers. Residential development is located at the edges of the city center, while industrial activities, which often require a high amount of land, populate the urban fringe. Both land and location are acquired in a transaction, and can thus be traded-off. The minimum land value considered by the model is the value of agricultural production. Although the supply of land can be assumed fixed, land use can be restricted due to zoning restrictions including e.g. public parks.

Criticism and limitations

The bid rent model traditionally assumes urban structure to follow the internal pattern of American cities with a central business district (CBD) and surrounding suburbs and industrial sites. The notion of a monocentric city is, however, not accurate in describing every city (Ottensman, 2008). Especially in Europe city centers traditionally include a major residential component, while multiple (sub)centers of employment at the edges of cities often exist. This affects the structure of land prices as peaks in land rents may exist in areas which are characterized by competitive features. In the case of the residential sector this includes areas where the amount of urban amenities is high and areas near attractive natural space (Brueckner et al., 1999). Furthermore, the model assumes a rational bidding process and a perfect market. Bid rent patterns may however be distorted by

existing built structures, social housing, regulations, lease constructions or the acquisition of land by the government, or speculation. Empirically, land prices are difficult to determine as transactions are infrequent, and the ownership of land is often included in the transaction of property.

2.4.2 Applicability within WaLTER

Explorative interpretation for the Wadden area

The Wadden area has particular features that exert a significant influence on the value of the land it contains. For instance, especially at the Wadden isles and at the mainland coast at the Lauwersmeer area nature protection schemes prevent the development of land. Especially development on the islands is limited, excluding vast amounts of land from the market which in turn elevates the value of those lands that are traded. Indeed, figure 8, which shows the prices of land in the Wadden area, indicates that the price of land is particularly high on the isles. On the mainland coast land rents are often far lower given their peripheral locations and lack of amenities, resulting in a dominant presence of agricultural land use. Notable exceptions are lands in Den Helder, which accommodates a Naval base and the ferry to the isle of Texel, the harbor town of Harlingen, and Delfzijl which is characterized by a strong presence of the industrial sector. Many areas in the Wadden area are relatively peripheral from economic networks. These areas generally have a low land price and are used in the most extensive form of production included in the bid rent model, agriculture.

Land prices

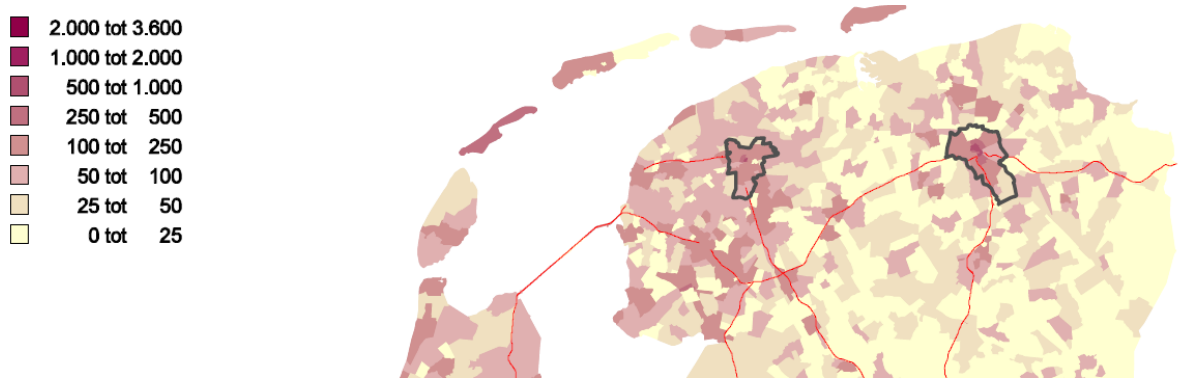

Figure 8. Estimated land prices averaged at four-digit postcode level in 2007. (Source: De Groot et al. 2010, p.24)

Possible variables for Wadden area monitoring

Indicator
Land price
Land use functions
Agricultural productivity (ha)
Soil quality
Public land, buildings, and infrastructure
Zoning regulations
Property locations
Property prices
Population density
Commuting distance

Further reading

Alonso, W., 1964. *Location and land use*. Cambridge, Massachusetts: Harvard University Press.

2.5 Four quadrant model

2.5.1 Summary

What is it about?

The four quadrant model describes the main principles of the functioning of the markets for real estate assets and real estate use, including their interrelations.

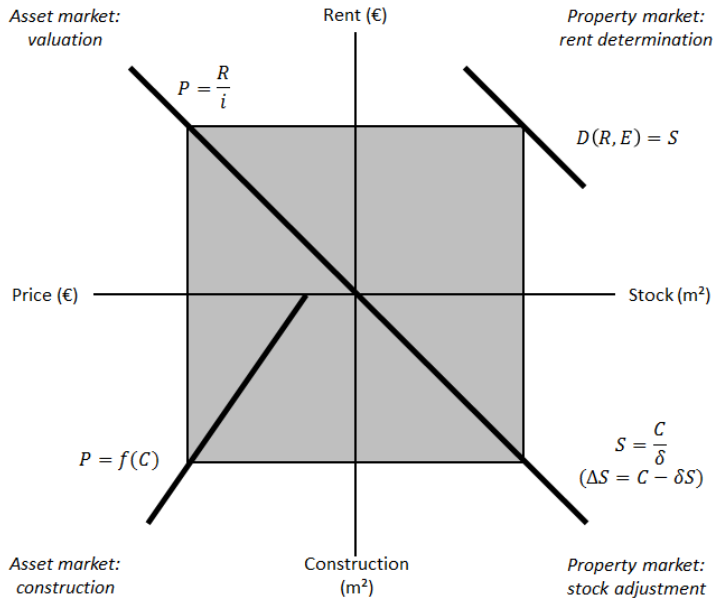

Figure 9. The four quadrant model (Source: DiPasquale & Wheaton 1996, p.8)

Further explanation

Real estate is characterized by durability, hence its supply and price are determined in an asset, or capital, market. Residential property prices reflect the demand for property-ownership, and likewise, a retail properties' prices will reflect the demand from investors and the availability of other retail properties' on the market. The demand for space is determined by rent[4] level and other exogenous economic factors (e.g. firms' or households' budgets). The asset market and the property market are linked at two points. First, the demand for real estate assets depends strongly on the rent levels determined in the property market. Second, supply increases through real estate development drive down prices in the asset market and cause decreases in rents in the property market. Market dynamics in the short run can be more volatile than in the long run as demand for real estate may change quickly while adjustment of the supply of real estate moves slowly due to time-lags in construction[5].

Criticism and limitations

The model does not take into account that adjustment at the supply side may not follow rises in property value as the supply of properties can be restricted. Also, the model does not account for the influence that the supply of public leasehold property may exert on the functioning of the private property market. Other limitations include market distortions resulting from auctions of foreclosures and refurbishment of properties within the existing stock. While the model is adequate in describing property market developments at a high aggregate level, it neglects spatial dynamics thus ignoring interactions between different spatial markets.

[4] For tenants this is the lease cost agreed upon in the lease-contract; for owners rent can be defined as the annualized cost of ownership of the property. The rent level is determined in the space use market.

[5] A sudden rise in demand for space will, given the slow adaption rate of supply, result in a rice in property prices. Prices that exceed construction and land costs result in new development. When the new space is available on the market, demand will be satisfied and prices will drop, moving towards the cost of replacement.

2.5.2 Applicability within WaLTER

Explorative interpretation for the Wadden area

The values of many variables considered in the four quadrant model may vary strongly in the Wadden. For instance, the asset market on the isles differs from the mainland in that costs of construction are higher due to the high cost of transportation of inputs. The mass of property value is located in or near urban cores, while relative high values may be found in areas characterized by both high demand and strict development restrictions constraining the supply of property. The average residential property values at the neighborhood level presented in figure 10 are, however, not determined locally but rather within housing market that are segmented either spatially or by substitutes (e.g. housing type).

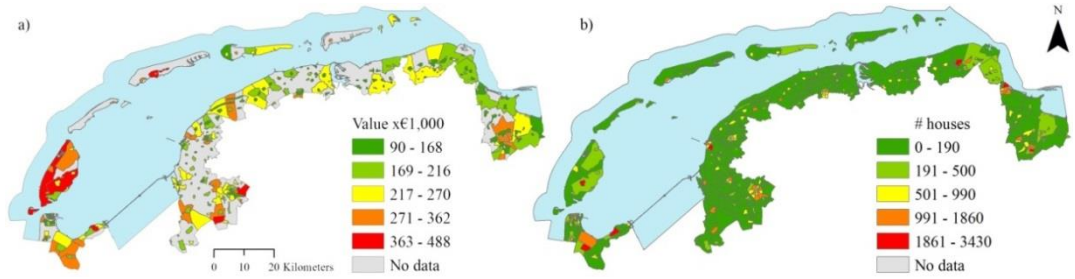

Figure 10. a) shows the number of houses on neighborhood level (2011), and b) shows the mean assessed value of these houses[6]

Possible variables for Wadden area monitoring[7]

Indicator
Property price[8]
Cost of leasing
Property taxes
Property stock
Construction costs
Building permits
Property demolition
Building age
Vacancy rate
% private owned property
% private leasehold property
% public leasehold property
Supply of property for private ownership
Supply of private leasehold property
Supply of public leasehold property
Share of second homes
Supply of second homes

Further reading

DiPasquale, D. & Wheaton, W.C., 1996. *Urban economics and real estate markets*. Englewood Cliffs, New Jersey: Prentice-Hall.

[6] Source: The Netherlands' Cadastre, Land Registry and Mapping Agency / Statistics Netherlands.
[7] Indicators should be measured separately for the main property markets and may yield significantly more insight when variation in indicator values by submarkets is captured.
[8] Arm's length sales price or lease transactions are considered to be the purest measures of a property's value as these are ought to reflect the market value of a property at the moment of the transaction. Assessed property values or lease costs (after the moment of transaction) may deviate from such market values, however, in some cases these values can provide a reasonable proxy for market prices.

2.6 Tourism area life cycle

2.6.1 Summary

What is it about?

The TALC concept, developed by (Butler, 1980; 2006a; 2006b) is the most robust and widely used conceptual and managerial framework in tourism worldwide and several authors have linked it to sustainability (Oreja Rodríguez, 2008). In the TALC concept the two axes visitors and time are central (Butler, 1980). In this two-axis framework five evolutionary stages for a tourism area can be defined: exploration, involvement, development, consolidation, and stagnation. After stagnation, the evolution of an area may take a variety of routes, with rejuvenation and new growth on the upper extreme and decline and diminishing numbers of visitors on the lower extreme.

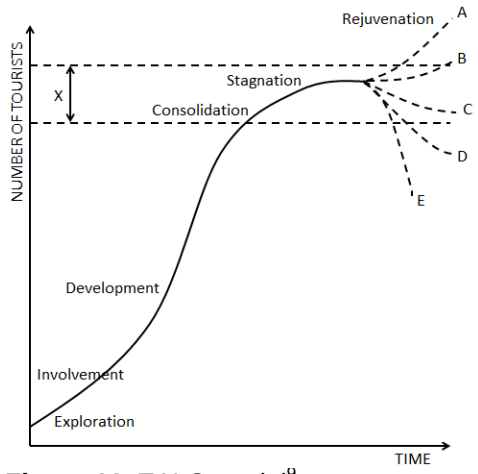

Figure 11. TALC model[9]

Further explanation

The TALC model, which Butler (1980, 2006a, 2006b) developed, builds on earlier work by Vernon who developed the product life cycle theory. The TALC model follows the stages of development described by Vernon, and is similar in considering changing production and trade-relations instead of goods and inputs. Key aspects to Butler's rejuvenation are the development of new activities and the reinvention of the tourism area (Baum, 1998). The development of a tourism area starts with adventurous tourists, often attracted to sites with attractive nature; in the involvement stage limited interaction between residents and tourists leads to the supply of basic services and the small-scale emerge of marketing, while a growth in these efforts accompanied by a number of visitors that exceeds the local population during peak periods characterizes the development stage; during the consolidation stage the region's economy has specialized toward tourism, yet growth rates of the sector level off; the following stagnation stage is characterized by the region reaching its full capacity of visitors and being out of fashion; and after stagnation there are five possible paths ranging from the extremes of rejuvenation (A in figure 11) to decline; the development path followed by a region is determined mainly by management decisions (Butler, 1980; Agarwal, 1997).

Criticism and limitations

The TALC model revolves around the number of nights tourists spend in an area, however, it does not consider market shares. Thus, the model neglects important dynamics of competition among tourism destinations. The model assumes visitors to be repeat-visitors. However, if one-time-visitors are considered the model becomes distorted because the market for a tourism area will gradually become exhausted (Lundtorp & Wanhill, 2001). Measuring overnights provides only the number of visitors that have stayed in registered accommodation (OECD, 2013). The TALC is not a forecasting model. Development and evolution of tourism areas are not 'given', but are also determined by policy, entrepreneurs and the consensus among them. Overnights as an indicator do not allow for shifts in the competitive positioning of the Wadden area compared to competing tourism destinations to be assessed. The TALC model is little integrated with the economic system; therefore Sijtsma et al. (2014) suggest that the analysis of tourism overnight stays should be complemented by analysis of developments in tourism employment and market shares.

[9] Adapted from Butler (1980). X is the critical range of elements of capacity.

2.6.2 Applicability within WaLTER

Explorative interpretation for the Wadden area

It seems that the Wadden area is currently in a mature stage, although it is difficult to substantiate in which stage it is actually positioned given the conceptual nature of the TALC model. Figure 12 shows an illustration of Terschelling. It indicates that before the end of the nineteenth century only little tourism existed at the isle, whereas the development of tourism started around the 1930's with visits from the rich elites from near urban areas. The development of the tourism sector takes off after the World War II, at a moment at which the previously dominant sectors of agriculture and fisheries had already declined strongly. Until present the tourism sector of Terschelling has matured. The Dutch Wadden islands have developed into very popular holiday destinations. During the period 1998-2009 Dutch tourists spent approximately four million nights on the Wadden islands on an annual base, fluctuating between 3,7 million and 4,2 million[10] (Sijtsma et al., 2012). Tourists generally have longer holidays, although the average length is decreasing. The rate of repeat-visit tourists is high. The hotel and catering industries on the Wadden islands have a share of approximately 70-80% in total leisure employment, while at the mainland coast this figure fluctuates from 32-58% across municipalities (Sijtsma et al., 2014b). It should however be noted that in these mainland coast municipalities, which typically have a larger urban base than the islands, a higher amount of hotel and catering services will be provided to the local population and thus the figures do not necessarily reflect a pure tourism industry.

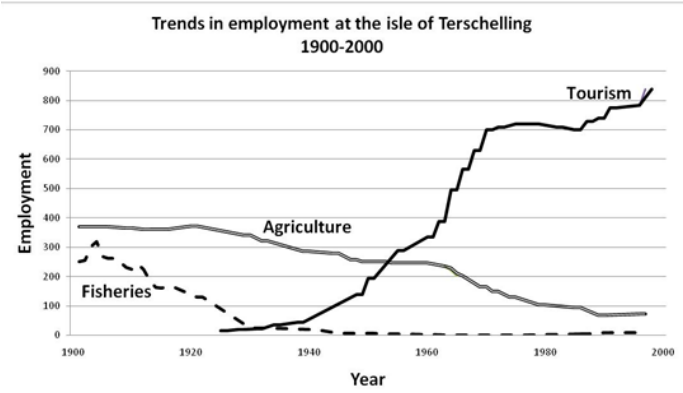

Figure 12. Employment at Terschelling in the three main sectors of the economy (1900-2000) (Source: Ferry and municipality administrations / Sijtsma et al. 2014)

Possible variables for Wadden area monitoring

Indicator
Tourism overnights in accommodation
Employment in tourism (supporting) sectors - Accommodation (narrow def.) - Accommodation and tourism-related/supporting (wide def.)
LQ tourism sector (degree of specialization, local vs. national)
Second homes

Further reading

Butler, R.W., 1980. The concept of a tourist area cycle of evolution: implications form management of resources. Canadian Geographer, 24, 5-12.

Sijtsma, F.J., Daams, M.N., Farjon, H. & Buijs, A.E., 2012. Deep feelings around a shallow coast. A spatial analysis of tourism jobs and the attractivity of nature in the Dutch Wadden area. Ocean & Coastal Management 68, 138-148.

Sijtsma, F.J., Hoekstra, H., Werner, G., Daams, M.N., Broersma, L., 2014. Tourism in the Dutch Wadden area: a spatial-temporal analysis identifying policy dilemmas. Journal of Tourism Research & Hospitality, forthcoming.

[10] Statistics Netherlands, online database Statline concerning 'Gasten in alle logiesaccommodaties; naar herkomst en toeristengebied'.

2.7 Tourism competitiveness

2.7.1 Summary

What is it about?

"Tourism competitiveness for a destination is about the ability of the place to optimize its attractiveness for residents and non-residents, to deliver quality, innovative, and attractive (e.g. providing good value for money) tourism services to consumers and to gain market shares on the domestic and global market places, while ensuring that the available resources supporting tourism are used efficiently in a sustainable way" (OECD, 2013).

(Relative) performance and impacts	Destination attractiveness
Quality and competitiveness of tourism services	Policy responses and economic opportunities

Figure 13. key categories of tourism competitiveness based on OECD (2013).

Further explanation

Competitiveness revolves around the economic performance of an area compared to the performance of competitors. "The range of source markets provides valuable information on strength in growth or declining markets to alert policy makers to relative strengths and weaknesses and future actions" (OECD, 2013, p.20). Shifts in competitiveness can be derived from developments in market shares and key economic performance indicators such as revenues or employment. Increasing the level of productivity of firms in a tourism area allows for a better competitive position of the area relative to competing areas, which should lead to constant or increasing profits over time (Crouch & Ritchie, 1999). The most pressing factors in tourism development are accommodation quality and occupancy levels (OECD, 2013). The measurement of visitor expenditures and tourism employment supports the identification of linkages between the tourism sector and the regional economic sectors since these may be strongly interlinked. Identifying development potential within the tourism sector "requires more detailed review within sub segments and how to develop growth strategies further through different strategies including branding and marketing to attract more revenue" (OECD, 2013, p24). To assess the possible future development information about the degree of consensus in the industry is key. Regarding the alternatives of market-development of a tourism destination it is important to prevent "a lack of consensus in the industry, which might make any future effort at strategic planning more difficult to accomplish" (Hovinen, 2002, p. 220).

Criticism and limitations

Since competitiveness revolves around relative performance, measures of visitor spend or overnight stays by tourists are not measures of competitiveness unless when compared with figures for competing areas. The development of values for such measures over time are meaningful when compared with market shares. However, it is difficult to delineate the market since it the potential market and the competing areas which it is attracted by may not be derived from statistics. Also, certain types of analysis of the development of the tourism sector requires segmentation of the sector. Neglecting potential segmentation of a tourism sector may yield wrong conclusions since regions with a high productivity rate, a key performance indicator which in the case of a high value generally indicates a positive economic state, may seem to outperform regions with a lower productivity rate while the reverse may be the case as in mature tourism sectors low productivity rates tend to be providers of luxury services (OECD, 2013). Also, identifying and measuring the growth in the export of tourism services is a challenge especially as these services are interconnected with other sectors (Sijtsma et al., 2012). Also, attributing changes in tourism exports to particular investments and interventions can be challenging and investment in regional branding or tourism service quality campaigns is no guarantee of an increase in competitiveness (Sijtsma et al., 2012). When resources from other sectors are shifted towards the tourism sector this may even affect the competitiveness of these other sectors (Crouch & Ritchie, 1999) and the general competitiveness of the region since the performance of a tourism sector may be volatile (Poon, 1993).

2.7.2 Applicability within WaLTER

Explorative interpretation for the Wadden area

Figure 14 shows that specialization towards tourism on the Wadden island is strong, while on the mainland it converges towards the Dutch average.

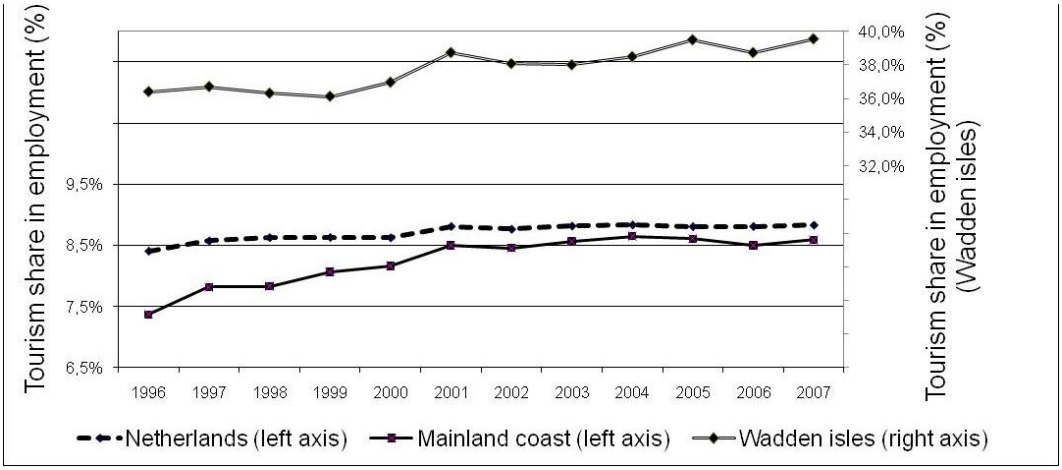

Figure 14. Tourism employment in the Netherlands, the Wadden islands and the mainland Wadden coast (1996-2007) (Source: LISA / Sijtsma et al. 2012)

Approximately 90% of foreign tourists are German. However, since 1998/1999 the number of nights spent by German visitors dropped from 1.7 million to 1.0 million in 2009. It is difficult to establish underlying causes which may arise from competition with other tourism areas since regular indicators do may not capture the behavior in decision making of tourists when they decide on their vacation plans. Such information may however be retrieved from local entrepreneurs, following the example of Michael Porter's (1990) analyses of regional competitiveness. The specific decrease in visitors described above may be a result of increased attractiveness of East Germany, including the inland area Mecklenburg-Vorpommern, as a tourism destination for Germans, especially after the fall of the Iron Curtain (Sijtsma et al., 2012). An example of increased attractiveness of the Wadden area's tourism sector is the increase in the number of recreational sailing movements which has doubled over the past 25 years. On an annual base 350,000 nights are spents aboard boats anchored in harbors around the Waddensea, though mostly at the islands and the harbors of Delfzijl, Den Helder and Harlingen (Sijtsma et al., 2012). Recreational sailors recently tend to use luxurious larger boats, although some continue to use shallower boats that can sail the ecologically vulnerable east-west route; anchoring and 'falling dry' with low tide. Mudflat walking is mainly undertaken in the eastern Wadden Sea. This activity has a small share in total tourist activities, yet it is very stable in popularity among tourists. A flourishing tourism sector may however generate externalities. For example, noise generated by tourist activities may have an effect on the behavior of certain animals in the many protected areas in the Wadden area. Also, the dominance of the tourism sector in the local economy may affect livability (Kim et al., 2013). For instance second homes may be empty for most time during the year or when the opening hours of basic services follow the seasonality of the main visitor flows while these services are not or less accessible to local residents during the off-season.

Possible variables for Wadden area monitoring

Indicator
Tourism direct gross regional product
Tourism revenues per visitor by source market
Overnights in accommodation
Tourism exports
Labour productivity in tourism services
Price level of tourism products and services (room prices)
Natural heritage sites
Preserved areas
Appreciation of natural assets
Cultural attractions
Creative attractions
Visitor satisfaction rating
Visitor intention for repeat visits
Stakeholder consensus on regional tourism strategy
Market share
Competitors
Tourism-related/supporting infrastructure
Occupancy rate in accommodation sector
Visitors origins
Proximity (to the market)
Tourism products supply chains
Tourist flows
Location of activities (e.g. walking/cycling/sailing/ships falling dry)
Noise level
Routes by type of boat
Number of boats by type

Further reading

Dupeyras, A. & MacCallum, N., 2013. Indicators for measuring competitiveness in tourism: a guidance document. OECD Tourism Papers, 2013/02, OECD Publishing.

Crouch, G.I. & Ritchie, J.R.B., 1999. Tourism, competitiveness, and societal prosperity. Journal of Business Research 44, 137-152.

Kim, K.., Uysal, M. & Sirgy, M.J., 2013. How does tourism in a community impact the quality of life of community residents? Tourism Management 36, 527-540.

Sijtsma, F.J., Daams, M.N., Farjon, H. & Buijs, A.E., 2012. Deep feelings around a shallow coast. A spatial analysis of tourism jobs and the attractivity of nature in the Dutch Wadden area. Ocean & Coastal Management 68, 138-148.

Sijtsma, F.J., Hoekstra, H., Werner, G., Daams, M.N. & Broersma, L., 2014. Tourism in the Dutch Wadden area: a spatial-temporal analysis identifying policy dilemmas. Journal of Tourism Research & Hospitality, forthcoming.

2.8 Regional concentration and diffusion

2.8.1 Summary

What is it about?

Theoretical models of regional concentration and diffusion are aimed to understand whether regional growth and development differentials remain steady or decline as a result of public intervention. The central question which these models revolve around is whether economic growth from investment in particular selected cluster-areas can spill over to surrounding areas (Malizia & Feser, 1999).

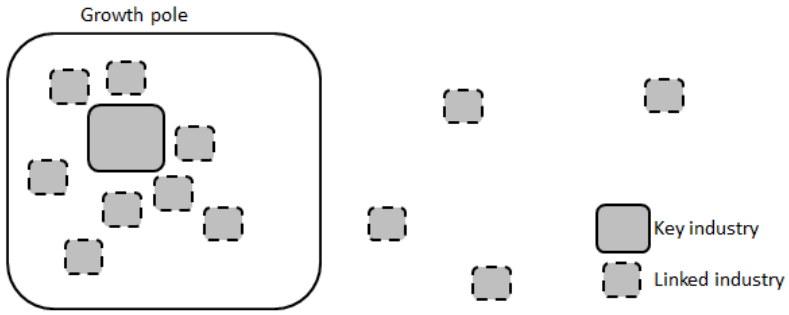

Figure 15. Conceptualization of a growth pole

Further explanation

Theories of regional concentration and diffusion regard economic growth as dynamic processes of spatial change of a region's production structure (Malizia & Feser, 1999). Central elements are the localization and clustering of employment, production and investment. These basic elements of regional concentration and diffusion models very much resemble neoclassical models and geographical models of the hierarchy of places. In the specifics of the model differentiation exists between several versions of the model which are the result of work by several authors prominent in the field. *Perroux's growth pole theory* describes how unequal impulses of regional growth are generated by powerful actors including large firms (Malizia & Feser, 1999). Large firms attract demand for the goods produced within its sector, elevating local production and sales. However the presence of these firms depress the market and production in other (related) economic sectors as large firms tend to dominate the market and depending suppliers. *Hirschman's theory of unbalanced growth* describes how public investment may influence regional growth. Its rationale is that the provision of certain services attracts private investment creating a center of regional growth (Malizia & Feser ,1999). Myrdal contributes to this line of thinking with his theory of cumulative causation which involves a vicious circle of economic growth. Conglomeration of labor, capital, goods and services in a center of growth attracts investment, which in turn increases the conglomeration process itself resulting in inequalities in regional economic growth as growth concentrates in specific areas. *Friedmann's core-periphery model* describes a set of stages of economic growth, starting with the pre-industrial stage, which is characterized by a dominant agricultural sector and an underdeveloped industrial sector, and with a fully industrialized economy as an end-point of development (Malizia & Feser, 1999). Each transition to a new stage influences the spatial distribution of the population, indirectly influencing the path of the region's future economic performance.

Criticism and limitations

The assumption that growth in central locations arising from (large) investments is challengeable, unless clear strong relations between the growth pole and the periphery exist (Malizia & Feser, 1999). Overall it can be difficult to attribute regional development to specific investments since economic sectors are often interwoven and negative effects investments on the existing economic structure should also be taken into account. Also economic leakages to external regions may depress spillover effects from growth poles to firms within the region. Kitson et al. (2004) stress that investment in innovation may yield strong positive results in one region, while a similar investment in another region may not result in the same economic effects. Consequently, regional investment strategies aimed to stimulate economic growth require careful analysis of the regional economic context relevant to the investment.

2.8.2 Applicability within WaLTER

Explorative interpretation for the Wadden area

Several examples of investments with a high impact on the socioeconomic development of the Wadden area can be given. One is Landal Esonstad a complex of approximately 200 apartments and bungalows for recreational use. This private development is isolated in space, located in the periphery of Northern Friesland in the Lauwersmeer area. While the development does not seem to yield much additional recreational and related economic activity (e.g. entertainment and catering), yet it resulted in pont to transport visitors to Schiermonnikoog departing from Esonstad inself additional to the pont which leaves from the Lauwersoog harbor nearby. This may generate limited additional employment, although it is plausible that these additional jobs may come at the cost of jobs in the Lauwersoog harbor. A larger private investment is the NUON magnum energy plant in the Eemshaven which at present generates 1,300 megawatts of electricity serving the demand of two million households. While direct regional economic benefits of this investment, including employment at the energy plant and the large-scale supply of energy are rather straightforward to measure, indirect effects including employment at supporting firms in contracting and engineering, and the success or failure of existing local firms or start-ups may be difficult to attribute to this investment. An additional complicating factor is the spatial component in economic development. Jobs generated may be filled in by commuting workers from other regions, especially when highly skilled labor is required. Also an understanding of the effects of the plant on other sectors resources (e.g. air quality in the case of the tourism sector) may require project-specific information on externalities since these may not be available from regular statistics.

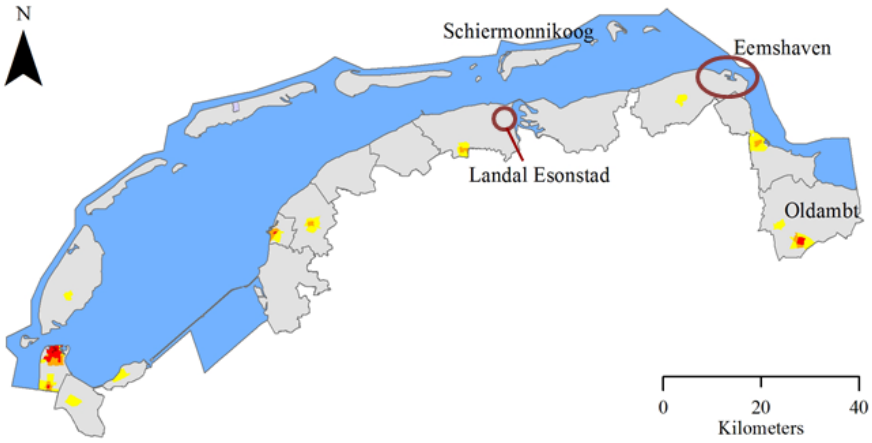

Figure 16. Two large investment projects in the Wadden area: Esonstad and the Eemshaven harbor and industrial area

Possible variables for Wadden area monitoring

Indicator
Public investment
Private investment
Economic output of firms
Employment at firm level
Commuting patterns
Firm demography: start-ups, deaths, integration
Distribution of the population
Project-specific indicators of externalities

Further reading

Malizia, E.E. & Feser, E.J., 1999. *Understanding local economic development*. New Brunswick, New Jersey: Center for Urban Policy Research, The State University of New Jersey.

2.9 Input-output model

2.9.1 Summary

What is it about?

Input-output (IO) models describe the interrelations between different economic sectors, households and government entities within a country's economy or different regions economies. I/O models allow for empirical analysis of the economic effects which result from stimulating or constraining economic sectors (Oosterhaven, 1981; Oosterhaven & Polenske, 2009).

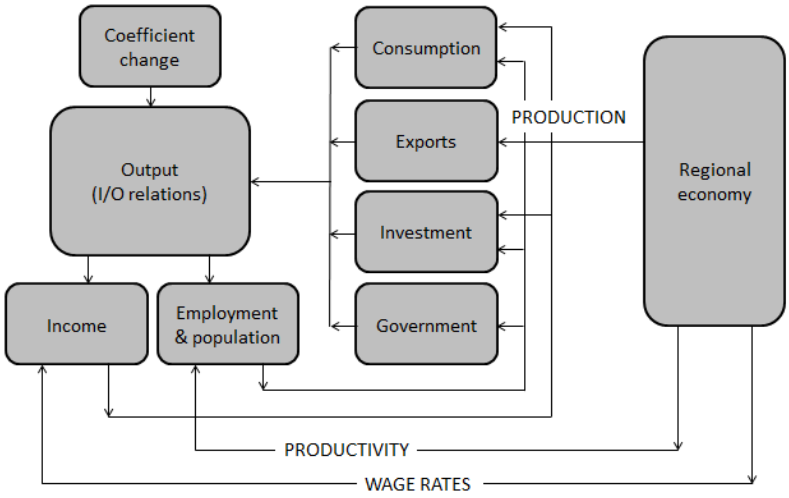

Figure 17. Conceptualization of a regional economy (Source: adapted from Stimson et al. 2002)

Further explanation

The focus of IO models are increases or decreases in added value and employment arising from sector-based trade relations (Oosterhaven & Polenske, 2009). Direct and indirect regional economic effects of project investments or policy changes can be forecasted using the model. The effects on a region's economy of changes in investment, household consumption, exports, imports, taxes, wages or depreciation can be calculated. IO models build on an IO table which quantifies mutual trade-relations between different economic sectors. This quantifications include the amount of inputs each sector requires from each source sector for its production. One sector's output is used as an input in another sector, and in this sense the IO model is related to the Economic Base model. The model requires data of the output generated by each sector (productivity) as well as the distribution of sales over the various types of buyers. Both increases and decreases in the production of a sector affect suppliers (backward effects) through the Leontieff multiplier effect and consumers (forward effects) of the sector through Ghosh multiplier effects (Oosterhaven & Polenske, 2009). Multiplier effects are linear. However, multiplier effects are reduced by demand leakages or economic leakages to external regions (Kissinger & Rees, 2010). Multiregional IO tables distinguish more than one region.

Criticism and limitations

IO models build on several strong assumptions, including the assumption of linear trade-relations between sectors described by fixed multipliers (Gowdy & Erickson, 2005); the assumption that changes in demand for and supply of a good are passed on to suppliers and buyers completely without price-adjustment; and the assumption that all inputs can be substituted completely. Another criticism is that unlike several other regional economic models IO models treat transportation costs as an implicit factor as these are difficult to integrate in the model due to their dependence upon industrial location which is lower than the regional scale of the model. Sectors are described rather abstract, and while firms may be active in more than one sector the multipliers defined in an IO model may be biased to sector classification and measurement. IO models include no feedback mechanism with the labor market. IO models also give a limited view of interconnections between economic sectors, households, and institutions, which may be solved by extending the model with social accounting matrix (SAM) (Gowdy & Erickson, 2005). IO models have also been extended in EIOA (Environmental Input Output Analysis) models to account for environmental footprints and externalities such as CO2 emissions (Kissinger & Rees, 2010).

2.9.2 Applicability within WaLTER

Explorative interpretation for the Wadden area

The IO model describes several spatial economic mechanisms that are key to understanding the economic development of the Wadden area. One is that the effect of investments include direct and indirect economic effects. Consider the tourism sector. An increase of production in this sector by 30% due to an exogenous event would result in the creation of additional of jobs and revenues in this sector (the direct effects of the event) and may also affect the production and employment of the construction sector (indirect effects) because there is additional demand for developing or renovating real estate with an accommodation function. Also the regions households consumption is affected as well as the government which enjoys additional taxes arising from the economic impulse. The regional effect of investment different industries may however show strong variation. While some sectors have predominantly intra-regional linkages, some sectors may leak growth to other regions, e.g. because they depend on highly skilled labor which can only be sourced from elsewhere. Also, investments in particular industries, for example those which are highly capital intensive such as the energy industry, may yield limited direct effects on the regional employment level, although indirect effects through maintenance may raise the effect of investment on the labor market.

Possible variables for Wadden area monitoring

Indicator
Inter-industry sales
Intra-industry sales
Productivity at industry level
Wage level
Private consumption
Exports
Private investment
Government investment
Sectoral employment
Tax rate

Further reading

Oosterhaven, J., 1981. Interregional input-output analysis and Dutch regional policy problems. Aldershot: Gower publishing.

Oosterhaven, J. & Polenske, K.R., 2009. Modern regional input-output and impact analysis. In R. Capello & P. Nijkamp (Eds.), Handbook of regional growth and development theories, pp.423-439, Cheltenham: Edward Elgar.

2.10 Five forces of competition

2.10.1 Summary

What is it about?
The five forces of competition taken together form a framework that enhances our understanding of the international competitiveness of firms (Porter, 2008). The framework is often referred to as 'Porter's Diamond'.

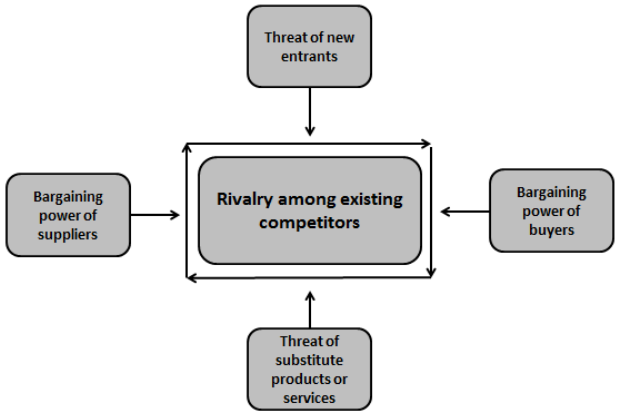

Figure 18. The five forces of competition (Source: Porter 2008, p.27)

Further explanation
In section 2.1 it is described how competitiveness is an absolute core factor in regional development. According to Porter's model, five main competitive forces shape the strategy of firms. The configuration of the forces differs by industry. When the five forces are intense only few firms may earn sizeable returns on investment, while many firms may earn relatively much when the forces are benign (Porter, 2008). The first force is threat of entry which includes potential pressure on prices, costs of additional investment to compete with new entrants to the market. Markets typically have different level entry barriers, advantages to new entrants including: economies of scale of competitors, large market shares of competitors that increases buyers willingness to pay for their products, costs customers must accept for switching, substantial investments necessary to compete, unequal access to distribution channels, restrictive government policy, incumbency advantages, and expected retaliation by competitors (Porter, 2008). The second force is the bargaining power of buyers. Powerful buyers drive down prices, demand higher quality products or services which elevates competition and drives down margins within the industry. The third force is the bargaining power of buyers. Powerful suppliers depress industry-wide margins as they capture more of the value generated along the production chain, e.g. by charging higher prices or shifting costs to suppliers of the product. Low returns resulting from competition may propel innovation, for instance through the invention of substitute products superior to the original product (Porter, 2008). A substitute, which is the fourth force, performs the same or a similar function as an industry's product by a different means. However, the threat of substitution may be indirect and thus difficult to recognize. For instance, lawnmower production may be threatened by a trend of living in apartments rather than in single family homes. Existing competition, which is the fifth force, includes price discounting, new product introductions, advertising campaigns, and service improvements. High competition may decrease industry productivity. The five forces model can be linked with trade theory which can be used to explain regional cross-border economic transactions. Trade models describe why regions engage in trade, how interregional specialization is determined, what the effects of protectionist measures are and how optimal trade policy can be achieved (Malizia & Feser, 1999)

Criticism and limitations
Several authors discuss whether regions compete based on comparative (e.g. Ricardian) advantages or competitive advantages. The rationale underlying theory of comparative advantages is that some regions posit a natural advantage over other regions due to their endowment with relative immobile production factors derived from an abundance of production factors (external to the firms but to their beneft, e.g. attractive nature) (Camagni, 2008; Kitson et al., 2004), while competitive advantages result from the management of production and marketing (Kitson et al.,

2004). While productivity is the key driver of competitiveness in the long-run (Krugman, 1990), according to Kitson et al. (2004) the regional employment rate is of similar importance as a driver of competitiveness. Besides 'hard' productivity, soft factors including the skills and quality of the labor force, the range and quality of cultural facilities and assets, the presence of an innovative and creative class, and the scale and quality of public infrastructure are important to sustain regional economic development (Kitson et al., 2004).

2.10.2 Applicability within WaLTER

Explorative interpretation for the Wadden area

Competition is a key mechanism in the regional development of the Wadden area, yet, this mechanism is difficult to quantify for several reasons. One reason is that although competiveness itself is reflected by firm's continuing ability to generate profits, developments in the firm's absolute economic size (e.g. employment, profits) which are rather straightforward to measure do not reflect competitiveness. Theoretically, when profits decline a firm may still remain profitable and perform better than the other firms in its sector – and thus be competitive. An example is the mussel fishing sector in the Wadden area. Although profits are limited by competition with the far larger mussel fishing sectors mainly located in Spain, China, Thailand, and France, the sector still is profitable. On the local market its firms can sell a superior product consisting of fresh (an absolute advantage) mussels to buyers. Branding and regional marketing may create an additional competitive advantage to the local fishers. On the non-local market, however, prices are set by a structure of large-scale demand and supply with many (international) buyers (e.g. retailers) and sellers (e.g. French or Chinese mussel fishers) surpassing the influence of fishers selling mussels from the Wadden area on the prices paid for their products. This relates to the another reason because of which the mechanism of competitiveness is difficult to measure; power-relations within the supply chain may not be transparent. Also, it may not be clear with which firms Wadden area based mussel fishers compete, either at the local and the non-local market, since even firms producing the same product may serve different markets demand. Even so, products may be slightly different (e.g. structurally big versus small mussels) and therefore serve different segments of a market. Also, gathering information highly relevant to the competitive position firms, including the availability and cost of capital, policy-induced investments (e.g. mussel seed injection systems in the case of mussel fishers), is costly. Such information, which is of paramount importance to the development of regional policy aimed to create and sustain competitive advantages for the Wadden area's industries, may most effectively and efficiently be derived from entrepreneurs themselves. Following the rationale of Porter's (1990; 2008) research strategy, which was built on surveying entrepreneurs, panels of entrepreneurs who gather on an annual base may contribute strongly to the understanding of current and future developments of the Wadden area's economic sectors.

Possible variables for Wadden area monitoring

Indicator
Productivity at both firm and regional level
Regional employment rate
International market shares per sector
Spatial markets
Exports by destination
Threat of new entrants to the market
Bargaining power of suppliers
Bargaining power of buyers
Threat of substitute products or services
Rivalry among firms
Skills and quality of the labor force
Range and quality of cultural facilities and assets
Innovativeness and creativity of the population
Scale and quality of public infrastructure

Further reading

Porter, M.E., 2008. The five competitive forces that shape strategy. Harvard Business Review, January issue, 25-41.

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3 KEY INTEGRATIVE CONCEPTUAL MODELS

3.1 Quality of life

3.1.1 Summary

What is it about?

Quality of life (QOL) can be defined as "the extent to which objective human needs are fulfilled in relation to personal or group perceptions of subjective well-being" (Costanza et al., 2007, p.269). Subjective well-being is the individual's satisfaction with past, present and potential lives (Diener et al., 1999). QOL at the individual level is the result of the satisfaction the individual achieves as a result of the consumption of market goods, leisure, public goods and other characteristics (physical and social) of the environment in which it is located (Lambiri et al., 2007).

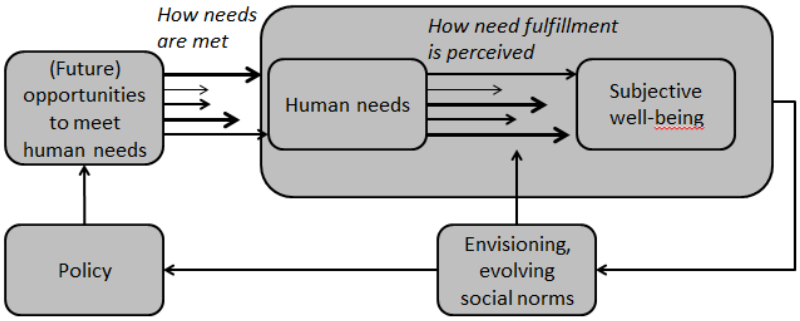


Figure 19. "QOL as the interaction of human needs and the subjective perception of their fulfillment, as mediated by the opportunities available to meet the needs" (Source: Costanza et al. 2007, p.269)

Further explanation

QOL can be measured either as a single entity, involving asking an individual the question ""How do you feel about your life as a whole?", or it can be measured separately for distinct domains of one's life (Cummins, 1996). The measurement value is specified on a Likert scale of life (dis)satisfaction. The most supported domains in the literature are: 'emotional well-being', 'health', 'family connections', 'material wealth or well-being', and 'productive activity' (Andrews & Withey, 1976; Cummins, 1996). Cummins (1995) proposes two additional domains of safety and community. These aggregate categories have the benefit of allowing to reduce the number of questions asked to a manageable number (Cummins, 1996). Other than life satisfaction, economists also study happiness (Frey & Stutzer, 2002). Self-ratings of happiness do however tend to reflect short-term situations, while self-ratings of life satisfaction seem to measure longer-term situations – and thus may be more stable as a measure (Helliwell & Putnam, 2004). Self-reports on life satisfaction may reflect peer group comparison rather than an absolute evaluation (Costanza et al., 2007). The anticipation of a change in QOL derived from acquiring or giving up a certain quantity of a good affects consumption (e.g. location) decisions of firms and housholds (Wingo, 1973). Rural dwellers have been found to state a higher QOL in richer countries (Shucksmith et al., 2009).

Criticism and limitations

Traditional economists criticize life satisfaction measurement for in their view utility can't be measured directly using a stated preference approach. Another limitation of the stated preference of life satisfaction measurement is that people will group life components idiosyncratically, representing a single domain and then weight these components differently (Cummins, 1996, p.304; Ferreira & Moro, 2013). Weights can however be calibrated to better match the weights a majority of the individuals in the sample would agree upon (Hagerty & Land, 2007). However, some domains may have a low score for the majority of individuals in a sample, e.g. when the domain doesn't concern them, and may exert strong negative bias when aggregated to a single quality of life index over multiple domains (Cummins, 1996). Inaccurate measures may result from individuals not answering questions truthfully, or hedonic treadmill bias (Costanza et al., 2007).

3.1.2 Applicability within WaLTER

Explorative interpretation for the Wadden area

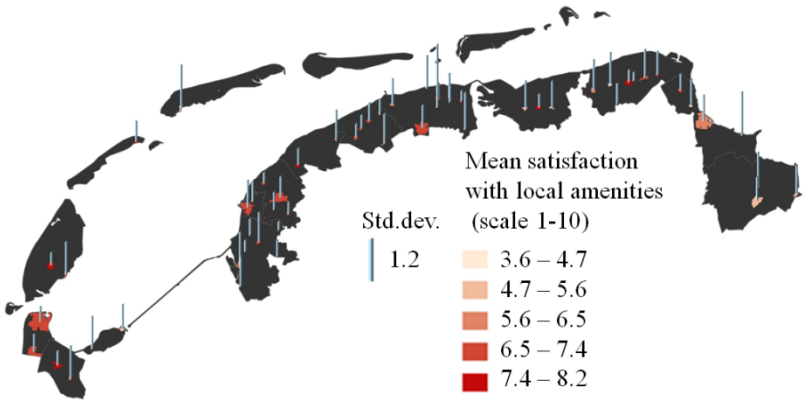


Figure 20. 700 Wadden area inhabitants satisfaction with local amenities (score 1-10), mean and standard deviation at village level

Due to the gradual disappearance of traditional rural economic sectors in area during the last century, and the resulting change in QOL which may affect location decisions of firms and households as suggested by Wingo (1973), rural life has changed considerably. Such dynamics at village level influence the populations need for certain local amenities. Figure 20 describes 700 Wadden area inhabitants satisfaction with local amenities of individuals satisfaction scores reported at village level using the mean and standard deviation. The figure shows clear differences in the satisfaction of surveyed residents needs between different villages. Surveyed residents of Delfzijl score their satisfaction with local amenities at a 5.6-6.5 on average, and the low standard deviation indicates that to some extent there is consensus about this score. There does not seem to be a big difference in scores and consensus that can be attributed to the size of villages. While figures on QOL on village level are useful to support understanding socioeconomic developments in the Wadden area, very different social groups live in the Wadden area, which implies that assessing QOL at the personal level can provide highly policy-relevant results since these don't average out over the total population observed. Distinctive subgroups include among others those who are relatively immobile, the elderly, 'immigrants' from other parts of the country or long-time residents. For example, the first two groups mentioned may be relevant, and even more if they are located in relative peripheral areas, because these may increasingly be dependent upon the availability of (public) transportation or their social network in order to receive care or take part in daily routines including buying groceries.

Possible variables for Wadden area monitoring

Indicator
Life satisfaction (overall)
Satisfaction with emotional well-being
Satisfaction with health
Satisfaction with family connections
Satisfaction with material wealth
Satisfaction with work
Satisfaction with safety
Satisfaction with community

Further reading

Costanza, R., Fisher, B., Ali, S., Beer, C., Bond., L, et al., 2007. Quality of life: an approach integrating opportunities, human needs, and subjective well-being. Ecological Economics 61, 267-276.

Cummins, 1996. The domains of life satisfaction: an attempt to order chaos. Social Indicators Research 38, 303-328.

Diener, E., Suh, E., 1997. Measuring quality of life: economic, social and subjective indicators. Social Indicators Research 40, 189-216.

3.2 Human Development Index

3.2.1 Summary

What is it about?

The Human Development Index (HDI) is a model that brings to together a large set of objective social indicators which' weighted outcome, described by the HDI index, provides a single composite measure[11] of quality of life at the country level. Measures of life satisfaction are included in the model, complementary to the social indicators that describe external attributes that may affect individual's development. The model was introduced by the United Nations in 1990, aimed to relate economic growth to individual's well-being instead of income alone.

Further explanation

The HDI provides a ranking of the human development, as measured, of both developed and undeveloped countries. The HDI consists of a main aggregate index, sub-aggregated indexes and the separate indicators. The main model's indicators are 'life expectancy at birth', 'mean years of schooling', 'expected years of schooling' and 'gross national income per capita', and further includes indicators for the main categories: gender inequality, multidimensional poverty, command over resources, health, education, social integration, international trade flows of goods and services, international capital flows and migration, innovation and technology, environment, and population trends (UNDP, 2013). The social indicators in the HDI model are proxies for components of actual human development, describing the state of an environment (e.g. access to health facilities). A benefit of the HDI's social indicators is that they contain information that is not captured by traditional economic measures such as measures of income (Diener & Suh, 1997; Osberg & Sharpe, 2002). Objective QOL measurements are, however, often narrow, opportunity-biased, and cannot incorporate issues that contribute to QOL such as identity or psychological security – as Diener & Suh (1997, p.207) put it "what is good for people cannot be determined without taking their views into account". Therefore HDI includes QOL domain questions in indicators.

Criticism and limitations

As between developed Western countries little variation in some of HDI's measures' values exists (e.g. a literacy rate of 99% is assumed for these countries), the HDI is criticized for being less adequate in capturing the performance of these countries than it is for developing countries (Brereton et al., 2011). Measures that are based on objective standards, however, are also needed to judge the conditions of a society because people can be tolerably happy even in many undesirable circumstances. The parallel use of social indicator and subjective well-being measures is important for a methodological reason as well. Because the measurement of weaknesses of the two types of assessment are not the same, they provide alternative views of societal quality that are unlikely to be affected by common errors of measurement (Diener & Suh, 1997). However, the relation between objective and subjective QOL in urban areas has been found to be weak by McCrea et al. (2006). Diener & Suh (1997) discuss several empirical weaknesses of social indicator models that apply to the HDI. They state that social indicators are likely to be: erroneous (e.g. underreported incidents); subject to measurement error due to the inevitable role of subjective decisions in variable selection and measurement; questionable as they may not unequivocally represent the society's notion of 'good'; controversial due to lack of consensus on variable selection and weighting in the literature; and inaccurate in reflecting people's experience of well-being, which is more complex than assumed by social indicator models. The HDI is inadequate at capturing differences in QOL at lower spatial levels given that many of its variables are at the regional or even national scale.

[11] We do not cover the composite index for it may conceal variation in indicator's values over space or subpopulations. Hence, we focus on the separate indicators used in the model and not their relative weights within the model.

3.2.2 Applicability within WaLTER

Explorative interpretation for the Wadden area

The HDI being a model intended for assessing quality of life at the country level. We deem some of its indicators irrelevant to monitoring socioeconomic development in the Wadden area. This includes the illiteracy rate, which approximates 100% in the case of the Netherlands (UNDP, 2013). Furthermore, indicators for the experimental 'multidimensional poverty index' are not taken into account since the Wadden region is located in a highly developed country. Some of the models indicators, e.g. life expectancy, show little spatial and temporal variation and may be more adequately measured at a special scale higher than the Wadden area. Many of the HDI model's large number of indicators can however provide valuable information at the regional level. For example, the mean years of schooling and the performance of high school students may give indications about the quality of the potential labor force. The percentage of broadband internet subscriptions is subject to current debates about regional development policy since the productivity of both firms and households located in peripheral rural areas may depend on access to high-speed internet connections.

Possible variables for Wadden area monitoring

Indicator
Mean years of schooling
Gross income per capita
GINI coefficient
Quintile income ratio
Mortality rate (infant/adult/under five)
Adolescent fertility rate
Population >25 years old with at least secondary education
Labor force participation rate
Gross regional product
Gross regional product per capita
Gross fixed capital formation
Public spending on health
Public spending on education
Physicians per 1,000 people
Educational enrollment (primary/secondary/tertiary)
Performance of high school students
School dropout rate
Employment to population ratio
Youth unemployment
Trust in people
Perception of safety
Homicide rate
Suicide rate
Exports of merchandise goods in €
Imports of merchandise goods in €
Exports of services in €
Imports of services in €
Exports of intermediate goods in €
Imports of intermediate goods in €
Foreign direct investment
Private capital flows
Net migration rate
Number of (in- and out-) migrants
Inflow of tourists from external regions
Expenditures on R&D
Researchers per million people
Graduates in science and engineering
Graduates
Patents granted
Broadband internet subscriptions
Energy from fossil fuels

Energy from renewables
Carbon dioxide emissions
Greenhouse gas emissions
Natural resource depletion
Forest area
Fresh water withdrawals
Endangered species
Agricultural land area
Population living on degraded land
Total population
Population in urban areas
Median age
Total dependency ratio
Total fertility rate
Satisfaction with health care quality
Satisfaction with education quality
Overall life satisfaction
Satisfaction with freedom of choice
Satisfaction with job
Satisfaction with community

Further reading

United Nations Development Programme, 2013. Human Development Report 2013, the rise of the South: human progress in a diverse world. New York: United Nations Development Programme.

3.3 Livability

3.3.1 Summary

What is it about?
In this report livability is defined as suitability for human living, and can be applied to spatial units (e.g. a village, city or community area)[12]. This suitability is determined by the (dis)utilities that individuals derive from the services provided by specific (dis)amenities[13] in or near the area regarded and the quality of community life.

Further explanation
Livability is of a latent character, it is a composite of several contestable components (Kaal, 2011). It is related to both direct and indirect components; it is however not agreed upon in the literature which components these are. Livability is considered to be connected directly to the accessibility of amenities that serve basic human needs: grocery stores, healthcare facilities; and amenities that serve relative higher needs: natural areas, leisure areas, community centers. It may also be directly influenced by the characteristics of the area in regard including the occurrence of criminal activities (Epley & Manon, 2008; Hashimoto & Kodama, 1997), identity as a sense of place (Costanza et al., 1997), or the amount of elderly people or young families. Livability is considered to be connected indirectly to connectedness, in both the traditional sense of road and rail infrastructure coverage and quality and broadband internet availability; population density[14], as services may require a threshold number of consumers to abide which is more likely to be met in high density areas; rural-urban connections (Partridge et al., 2010), as it can be argued that the population density of the area in regard may be less critical if the area is well-connected to urban areas which amenities may serve the needs of the regarded area's inhabitants, offer them employment and thus income to import to their area of residence[15]. It is clear that interrelations will exist between both direct and indirect determinants of livability. Importantly, with recent development in transportation, rural areas economies have become more integrated with urban economies allowing for these areas to be transformed into mere housing areas without significant decreases in livability. Obviously, certain groups of the population that are less mobile (e.g. the elderly, the disabled, or children) may depend more on local services than others.

Criticism and limitations
In the operationalization of livability as a conceptual model several difficulties arise. First, the literature there is not conclusive about the definition of livability or the determinants of livability. Second, the utility of the services provided by (dis)amenities is difficult to measure for the amenities that provide these services (e.g. natural areas) may be of public character and thus no clear market for their services exists. Third, aggregating livability to the area-level requires assumptions about the population of individuals residing in the area as heterogeneous consumer preferences would result different levels of utility to be derived from the same services, introducing a weighting issue. Therefore in the literature indicators of livability in an area are often limited to measures of potential access to amenities in or near this area as proxies for the actual livability carrying services consumed by individuals residing in this area.

[12] Conceptually, livability differs from quality of life (QOL; this concept is discussed in section 3.1) in the scale it refers to as it focusses solely on services of (dis)amenities that may affect *an area's* suitability for living, while the broader concept of QOL describes *individuals'* life satisfaction – which may be affected by the livability of the area where the person resides among other factors (e.g. income or job-position) that are relevant in the individual's perspective.
[13] E.g. public schools or landfills.
[14] However, a critical threshold may exist as livability may decrease due to 'overcrowding' after a certain density of population is reached. Another typical effect of increased density is the decrease in natural open space.
[15] For this reason rural areas near urban areas may be more prosperous than more remote rural areas.

3.3.2 Applicability within WaLTER

Explorative interpretation for the Wadden area

A large share of the region's population and regional employment has shifted its location towards urban cores, which has changed many rural villages dynamics. Consequently, in the Netherlands rising urbanization has played a key role in livability thinking since the 1960's (Kaal, 2011). Within the current debate regarding spatial policies targeted at improving livability a major point of focus is population decline as a driver of decreases in livability. Essentially population decline erodes both the market for local services and amenities, including primary schools, public swimming pools and libraries, and the municipal tax base used to finance public services and amenities. Consequently some villages may increasingly become places with a predominant residential character because people work and spend leisure time elsewhere. Livability, however, does not equal the level of local services and amenities but rather reflects the accessibility of these from a certain residential area. Areas with no local amenities or services at all can be evaluated by residents as being perfectly livable places when residential quality is high and amenities can be accessed within a reasonable travel time. Nevertheless many rather objective qualities of residential areas and their surroundings can be measured to assess its livability, assuming that certain values for the parameters chosen are appreciated by residents while other values represent disutilities to them. These qualities may include the amount of criminal activities, the accessibility to grocery stores, the amount of community centers, and the quantity of attractive natural space. Some villages offer attractive residential locations, often at reasonable prices, attracting older middle-class migrants from urban areas throughout the Netherlands; while other villages offer affordable residential space attracting young migrants from surrounding rural or urban areas (Bijker, 2012), many of whom work in a nearby urban core.

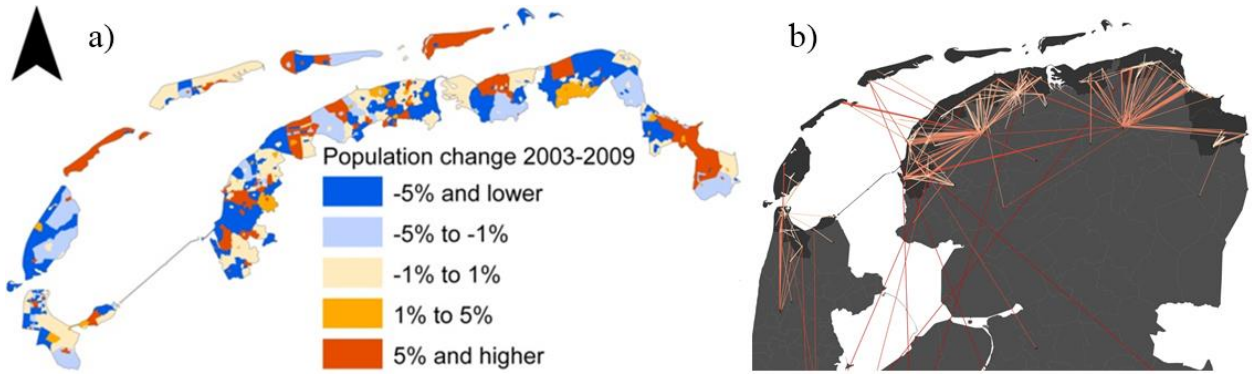


Figure 21. a) Neighborhood level population change in the Wadden area (2003-2009); b) places where the 700 surveyed Wadden area inhabitants buy their electronics; a darker *colored line* corresponds with a higher distance between the living location of the respondent and the location of the store[16].

[16] Source: a) The Netherlands' Cadastre, Land Registry and Mapping Agency / Statistics Netherlands; b) own data.

Possible variables for Wadden area monitoring

Indicator
Population density
Transport infrastructure
Public transport
Broadband availability
Accessibility of grocery stores
Accessibility of healthcare facilities
Access to leisure services
Aesthetic quality of nature
Quantity of nature
Sense of place
Community centers
Crime
Distance to urban center
Commuting
Rural-urban commuting
Religious institutions
Child day care services
Public housing units
Access to amusement services
Educational facility accessibility
Access to libraries
% single-parent households
% population on social welfare
Population age distribution
Population development
Ethnicity of population
% adults in labor force
Traffic accidents
Public facilities
Retail sales
% Vacant properties

Further reading

Kaal, H., 2011. A conceptual history of livability. *City: analysis of urban trends, culture, theory, policy, action*, no.15(5), 532-547.

Epley, D.R. & Menon, M., 2008. A method of assembling cross-sectional indicators into a community of quality of life. *Social Indicators Research* 88, 281-296.

3.4 Immobile resources

3.4.1 Summary

What is it about?

Immobile resources are location-specific and can't be transferred to another location (Terluin & Post, 2000). Immobile resources are argued to provide a stable basis on which to build a regional economy in peripheral rural regions (Bryden & Munro, 2000). While mobile resources including capital, information, skilled labor and other goods and services may flow from rural areas towards urban areas when factor mobility is high[17], the immobile resources remain[18].

Further explanation

Some immobile resources are tangible (e.g. property, or nature), others are intangible (e.g. values, knowledge, or culture). Following Bryden and Dawe (1998) resources can be distinguished to four types: "(1) social capital: this encompasses the features of social organization such as trust, norms and networks, which can improve the efficiency of society by facilitating coordinated actions. Social capital is embedded in relationships among people; it tends to cumulate when it is used and to be depleted when it is not; (2) cultural capital: this includes history, traditions, customs, language, music, art and stories, which may be territorially defined as belonging to an area; (3) environmental capital: this refers to the actual physical conditions of space of an area. It includes both natural environmental capital (landscape, climate etc.) and built environmental capital (structures of historical significance, physical and tourist infrastructure); (4) local knowledge capital: this is about the capacity of the area to generate, sustain and build on formal and informal stocks of knowledge and information. The immobile resources reveal the opportunities and constraints for local development and also the effectiveness of the local and regional institutional system in handling these opportunities and constraints. Economic development of rural regions can be explained by a combination of tangible and less tangible factors and the way these interact with each other in the local context." (Terluin & Post, 2000, pp.28-29). From an endogenous development perspective building an economy on immobile resources allows for retaining population and wealth creation in peripheral rural regions even under relative constrained public expenditures, declining or low employment in traditional natural resource based rural industries. Terluin & Post (2000) state that "mobile resources are scarce and rural areas have to compete with each other for these resources; success of one can only be achieved at the cost of the other. Bryden's thesis is that the competitive advantage of rural areas should be based on immobile resources, which are not open for competition." Indeed, rural areas may compete based on comparative advantages (e.g. a high stock of attractive nature) instead of competitive advantage (advantages derived from e.g. efficiency in the exploitation of resources) (Camagni, 2008). However, the markets for immobile resources' services is often open to regional competition. An example is the case of competition between tourism destination areas, although certain touristic assets such as natural capital may be immobile.

Criticism and limitations

Due to the endogenous character of development based on immobile resources this approach may be criticized for the assumption that localized growth potentials exist within regions, waiting to be activated (Terluin & Post, 2000). Another criticism, posed by Slee (1994), is that the approach may build on normative value judgments about desirability of forms of regional development.

[17] These circumstances characterize globalized or globalizing economies, and should lead to increasing urbanization according to the classical (e.g. neo-classical or core-periphery) economic theories.

[18] Related to immobile resourcesis the approach of territorial capital to regional development as discussed by Camagni (2008). The territorial capital approach to rural development builds "on natural and cultural resources that are able to generate new forms of local development in the long term" (Daviet and Monge, 2010, p.1497).

3.4.2 Applicability within WaLTER

Explorative interpretation for the Wadden area

Immobile resource theory underpins the idea that peripheral rural regions with immobile resource based economies may, compared to other such areas, perform relatively well in retaining population and wealth creation. Whether this holds for the Wadden area is a question which requires an empirical substantiation that is beyond this reports scope. However, in the case of environmental capital, which includes highly appreciated beaches, mudflats, tidal basins, birds, agricultural lands, and many other natural features, the relation with wealth creation seems to be quite clear. For instance, climate influences soil quality which is a key variable to the profitability of agricultural activities. An analysis of the shares in employment and public appreciated nature at the municipal level, presented in Sijtsma et al. (2012), reveals that the values of these two variables move in the same direction strongly. While nature is a tangible feature, its appreciation by the public is however intangible and therefore challenging to monitor – see section 5.1 for an elaboration on this topic and the discussion of an innovative monitoring tool. Other intangible immobile resources, which are social, local knowledge, and cultural capital, are also challenging to measure given their predominant latent properties. Social capital may consist of social cohesion within Wadden villages. Cultural capital may include the percentage of inhabitants who speak regional dialect. Some of the larger immobile resources in the Wadden area are the dikes which prevent large land areas from flooding and thus allow for economic activities and daily lives to take place in these areas. These are all examples of resources which do not flow and accumulate in urban cores, unlike labor (as many inhabitants of the Wadden area commute to Leeuwarden and Groningen). The Wadden area may benefit from economic development based on specialization based on utilizing immobile resources including the physical infrastructure which allows harbors to be operated competitively, or offering residential or tourist accommodation in an attractive natural landscape.

Possible variables for Wadden area monitoring

Indicator
Built cultural heritage
Appreciation of built environment
Appreciation of natural environment
Dialects
Regional culture
Climate
Landscape types
Physical infrastructure
Tourism infrastructure
Knowledge capital
Sectoral economic specialization

Further reading

Bryden, J. & Munro, G., 2000. New approaches to economic development in peripheral rural regions. Scottish Geographical Journal 116, 111-124.

Camagni, R.P., 2008. Towards a concept of territorial capital. In: Capello, R., Camagni, R.P., Chizzolini, B., Fratesi, U. (Eds.), Modelling regional scenarios for the enlarged Europe, Berlin: Springer, 33–47.

Terluin, I.J. & Post, J.H., 2000. Employment dynamics in rural Europe. Wallingford: CABI Publishing.

3.5 Ecological economics

3.5.1 Summary

What is it about?

Ecological economic models extend traditional concepts of consumption and production by including their ecological, social and ethical dimensions (Daly & Farley, 2004). Ecological economic models are underpinned by the idea that an economy "must be in a materials balance between raw materials entering the process and waste leaving" (Gowdy & Erickson, 2005, p.218). Ecological economic models are aimed to understand relations between economic and ecologic systems in order to improve long-term integrated and reinforcing management of both systems.

Further explanation

Main conceptual issues where ecologic economics shows differences from neoclassical models relevant for the type of indicators are the 'decision criteria': instead of a sole focus on efficiency, ecological economics focusses on equity, stability, and resilience of environmental and social systems (Costanza, 1989; Gowdy & Erickson, 2005); and the 'production process' where neoclassical models focus on the allocation of fixed resources and the production function, ecological economic models treat production as a biophysical process with joint production of goods and polluting wastes (Gowdy & Erickson, 2005). Of the latter the extended input-output model is an example. Key conceptual components in ecological economics models are monetary valuation, social value discounting, the rational actor model, coping with uncertainty, the role of efficiency in economic policy, production as both a social and physical process, and marginal analysis (Gowdy & Erickson, 2005). Given the limits of marginal analysis, ecological economics provides reasonable alternatives which are the analysis of complex adaptive systems (Ramos-Martin, 2003) and expanded input-output models (Illge & Schwarze, 2009; see section 2.9.1). These model allow for the analysis of large economic developments' impacts which cannot be captured through marginal effect analysis. The social component of ecological economics is partially reflected by the distinction made between individual values and social choices. While ecological economics can be regarded as a policy science, ecological economic models sensitive to the context in which they are applied, and action-oriented (Shi, 2004). In the context of the Netherlands the Dutch Advisory Council for Research on Nature and Environment (RMNO) has developed several indicators which describe the state of the environment (Rennings & Wiggering, 1997), and similarly indicators are discussed in Van den Bergh & Van der Veen-Groot (1999).

Criticism and limitations

Several ecological economic models deal with the 'value' of an action or object. The term 'value' may however have plural meanings depending on user-specified goals, objectives, or conditions and are thus influenced by peoples normative and moral views (Farber et al., 2002). Some models are used to forecast values, which is criticized by Ramos-Martin (2003) who stresses that economies are complex adaptive systems which functioning may not be forecasted when uncertainty about its mechanisms is involved. Also, neoclassical economists have challenged ecological economics continually for two main reasons. One is that ecological economic models extend the concepts of consumption and production used in neoclassical models, challenging the axioms of consumer choice and the assumption of perfect competition while these concepts are not relied upon anymore by recent neoclassical economic models (Gowdy & Erickson, 2005). The second reason is, neoclassical theorists argue, that ecological economics does not provide fully matured alternatives to conventional understanding of economic systems and the environment (Gowdy & Erickson, 2005).

3.5.2 Applicability within WaLTER

Explorative interpretation for the Wadden area

Understanding a specific developments net economic impact can be highly complex when multiple ecosystems, economic sectors or social systems are involved. For instance, an increase in energy production by coal-based plants in Eemshaven may serve the needs of many consumers, while a decrease in air quality associated with the increase in energy production may depress the market for health related leisure in nearby areas. Main issues in economic and ecologic interactions in the Wadden area include energy production indeed, the impact of fishing nets on seabeds, developments in the shellfish fisheries sector, a waste burning plant in Harlingen, and gas extraction (Daams & Sijtsma, 2013; Floor et al., 2013). Topics in the debate surrounding shellfish fishing include mainly the effects of cocklefisheries, which include the effects on the stock of these shellfish which indirectly influences the mortality rate among birds through its position in the ecosystems food web (Ens et al., 2004). Gas exploitation has been associated with land subsidence, decreases in landscape attractivity, and earthquakes driving down regional house prices and residents quality of life. Problems of such nature are often dealt with in ecological economic models. While negative developments often attract most attention in public debates, ecological economics does also deal with the valuation of benefits humans derive from the provision of public parks or dikes.

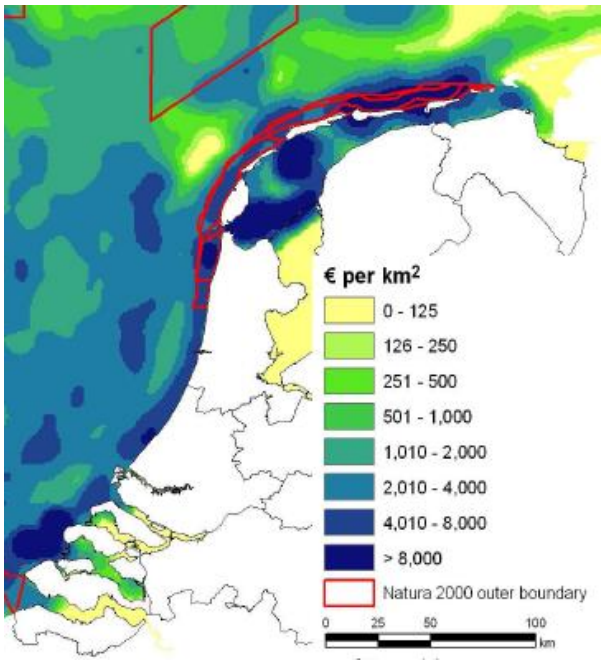


Figure 22. Distribution of the estimated catch value of the Dutch fleet in the Wadden Sea and the North Sea in 2008. (Source: Van Oostenbrugge 2010, p.46) Note that for a full image of catch values the catch values of the non-Dutch fleet should also be included. From this figure the delicate situation surrounding the fisheries sector becomes apparent clearly. The figure shows how relative high value fish extraction co-locates in space with the European level environmental protection scheme of Natura 2000.

Possible variables for Wadden area monitoring

Indicator
Nature preservation policy: Natura2000 / EHS
Raw environmental input materials (fish; land)
Waste from production
Resource use licenses per type of resource
Employment and memberships in nature conservation/management
Energy use per inhabitant
Share of fossil fuels produced and consumed
Share of alternative energy sources produced and consumed
Share of industrial sector in gross regional product
Use of fertilizer per km²
Use of pesticides per km²
Number of pigs per km²
Number of cows per km²
Acid depositions
Biodiversity
Deposition of metals
Soil dehydration
Stock of fish
Soil quality

Further reading

Daly, H. & Farley, J., 2004. Ecological Economics: Principles and Applications. Washington: Island Press.

Gowdy, J. & Erickson, J.D., 2005. The approach of ecological economics. *Cambridge Journal of Economics* 29, 207-222.

3.6 Sustainability

3.6.1 Summary

What is it about?

Sustainability, a concept popularized by the Brundtland report (1987), could be defined as a framework regarding "justice in the domain of human-nature relationship and in view of the long-term and inherently uncertain future, including (i) justice between humans of different generations ("intergenerational" justice), (ii) justice between different humans of the same generation, in particular the present generation ("intragenerational" justice), and (iii) justice between humans and nature" (Baumgärtner & Quaas, 2010, p.2057). As such sustainability applies to the mutual effects between the social, environmental and economic components of welfare (OECD, 2005).

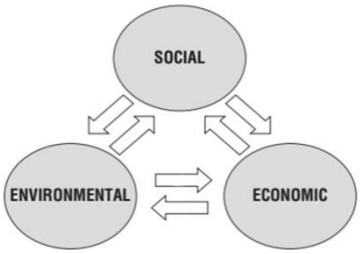


Figure 23. Relations between the three components of welfare distinguished in the sustainability framework

Further explanation

In general two types of sustainability are distinguished within the literature. One is 'strong sustainability', in which there is limited attention for (financial) costs of attaining sustainable development, and it is focused on environmental issues. This type of sustainability revolves around a system which' quality is regarded to relate to its physical attributes, including biodiversity, population, and soil erosion. The other type is 'weak sustainability', which focusses on the monetary costs of attaining sustainable development. This type of sustainability builds on cost-benefit analysis thinking, as it deals with trade-offs between social, economic, and environmental benefits. The emphasis is on levels of consumption, the allocation of resources, and monetary costs as main properties of system quality. The Bellagio principles, established in 1996, deal with four aspects of understanding the measurement of progress in attaining sustainable development. Major issues are that sustainable development is inextricably bound with the notion of equity; that the time-horizon at which developments are examined should span both human and ecosystem time scales; and that the spatial scale of assessment should include both local and non-local impacts on social, economic or ecologic systems (Hodge & Hardi, 1997). Typical for sustainability is that stocks as entities are regarded as the link between present day actions and future states of the social, economic, and ecological systems. Sustainability relates to panarchy which is a conceptual framework which is focused at stability and change in complex systems. It offers an integrative view on interrelations between economic development, ecosystems, and institutions at different scales (Gunderson & Holling, 2002). Related to this theoretical strand are theories about the resilience of systems, which describe the capability of a system to attain its original level of functioning after an exogenous impact or a shock in one of its components within a certain time span.

Criticism and limitations

Sustainability is a multi-faceted and contested notion with many alternative definitions. A constant characteristic of the framework are, however, its normative goals. Regarding the evaluation of sustainability, it is relevant that this framework takes into account a developments both local and non-local impacts on certain systems, a development may for example be sustainable at local scale but unsustainable at an international scale – a characteristic of the framework which emphasizes that a spatially disaggregated view on sustainability can be useful. The same logic applies for the factor of time. Reference points, be they spatial or temporal, may influence the evaluation of a developments level of sustainability (Bell & Morse, 2008). Another criticism is that 'weak sustainability' builds on the notion that "a great deal of nature's assets and asset services can be costed in integrated environmental and economic accounts… without resorting to utility and welfare estimates" (Bartelmus, 2010, p.2054), while the accuracy and potential of valuation techniques to capture the total value of these assets and services is heavily contested (Aldred, 2006).

3.6.2 Applicability within WaLTER

Explorative interpretation for the Wadden area

Sustainability revolves around social, economic, and ecologic developments. In the light of the ecologic element of the framework it is relevant that the Wadden area contains highly valuable nature which many people wish to conserve for its potential value to future generations, as evinced by the UNESCO World Heritage status of the area. In the light of the frameworks social and economic components it is relevant that in the Wadden area people live, work and spend leisure time. The degree of sustainability of each component separately is relevant; e.g. a continuing profitability of the region's firms, a stable high satisfaction with life experience by residents, and an attractive landscape to be enjoyed by both the local and the temporary population. However, attaining an integrated development of the Wadden area which is sustainable overall seems pressing to regional development policies. This is challenging due to trade-offs between ecological, economic, and social development which often arise. The weighing of the values involved requires monitoring of both conventional variables which allow for a development in a system to be evaluated (e.g. perceived life satisfaction, soil quality, economic competitiveness) and indicators associated with interactions between systems (e.g. environmental education, sailing behavior of tourists in ecologically vulnerable areas, CO_2 emissions by energy plants, air quality in touristic areas, exposure to flooding or earth quakes). Also innovations are relevant to understanding the level of sustainability of developments in the Wadden area. These may include agricultural cultivation in briny areas, the production of energy from renewable sources, or attempts to gain competitive advantages through regional marketing strategies for regional products.

Possible variables for Wadden area monitoring

Indicator
Air quality: CO_2 emissions; NO^x emissions
Intsensity of water use (abstractions / renewable resources)
Consumption of energy resources
Biodiversity
Biodiversity threatened species
Propertion of population with higher education
Quality of educational facilities
Rate and level of unemployment
Municipal waste generation intensities
GINI coefficients (rate of income equality)
Life expectancy at birth
Employment to population ratio
Education participation rates
Soil quality
Cost of electricity generation (per type)
Greenhouse gas emissions (CO_2)
Fish resources
Forest resources
Health
Efficiency of electricity generation
Water consumption per unit of electricity generation
Exposure to flooding
Earthquakes
Resource and material flows
Energy consumption firms
Energy consumption households
Population reproduction rate
Migration
Share of regional products in production and exports
Firms' competitiveness
Quality of life
Water consumption
Water storage
Population density
Population age structure

Employment structure and diversity
Importance of primary industries relative to growing and high income sectors
Unemployment rates
Presence of minority languages and cultures
Strength of regional identity
Rate of population natural increase
GDP per capita
Employment
Output
Strength of community identity
Subsidies per economic sector

Further reading

OECD 2011. Towards green growth, monitoring progress OECD indicators. OECD Publishing.

Baumgärtner, S. & Quaas, M., 2010. Sustainability economics – general versus specific, and conceptual versus practical. Ecological Economics 69, 2056-2059.

OECD 2005. Measuring sustainable development. OECD Publishing.

3.7 Project and policy evaluation

3.7.1 Summary

What is it about?
Project evaluation integrates economic and ecologic values aiding decision makers in making informed choices between project alternatives (Sijtsma, 2006). The dominant tools in project evaluation are cost-benefit analysis (CBA) and multi-criteria analysis (MCA).

Table 1. Summary of CBA and MCA characteristics (Source: Sijtsma et al. 2013, 18).

	CBA	**MCA**
Judgement criterion	Welfare changes of the population experiencing effects: costs and benefits to whomever they accrue.	Preferences of decision makers or stakeholders concerning the changes on different criteria.
Measurement stance	Preferably monetary measurement. Costs and benefits over time aggregated using social discount rate.	Criteria measured in their own dimensions; aggregation requires scaling of criteria. Relative weighing of criteria by decision-makers or stakeholders.

Further explanation
Project evaluation tools such as Multi-Criteria Analysis (MCA) and Cost-Benefit Analysis (CBA) are used widely to integrate economic and ecologic values and aid decision makers in making informed choices between project alternatives (Sijtsma, 2006). Project evaluation tools differ in the number of criteria appearing in their end results, to the extent that they apply monetary measurement in relation to whether they accept alternatives as given, or they aim to discover new ones (Boardman et al., 2011; Zeleny, 2011; Ananda & Herath, 2009; Belton & Stewart, 2002; Keeney and Raiffa, 1976). In the literature it is deemed essential that any type of evaluation present 'understandable metrics' for all stakeholders (Mooney, 2010). Since economic-ecological interactions have an inherently spatial character, it can be argued that insight into these interactions should be provided at the most detailed spatial resolution possible (Troy & Wilson, 2006; Bockstael, 1996). In evaluation two scale levels are central. "The first scale level stays close to the political or decision-making reality and thus is proximal to administrative borders[19]. The second scale level uses the global or the biggest spatial level on which impacts can be observed"[20] (Sijtsma et al., 2013, p. 6; Sijtsma et al., 2011). These scales are essential in determining the impact population consisting of those affected by the project evaluated.

Criticism and limitations
A major limitation of any project evaluation is that the outcome of the evaluation is influenced by weighting, valuation, and methodological choices. The specification and measurement of criteria are subjective. While projects may involve social, environmental, and economic values the framework of indicators used should be integrative. Expanding traditional CBA and MCA practices Sijtsma et al. (2013) integrate several characteristics of these evaluation tools and include links to the ecosystem services framework; they propose the MCCBA approach to evaluation. The judgement criterion in MCCBA consists of the "well-being changes of the impact population(s) (as with CBA) including non-monetary measurement of health and biodiversity concerns of the population (building on MCA)", and its measurement stance includes "consensus-based measurement (monetary and non-monetary) thus avoiding easily contested higher order relative weighing" (Sijtsma et al., 2013, p.18).

[19] This has a theoretical logic close to MCA, with its focus on the decision maker.
[20] This logic is closely connected to CBA's a-spatial market stance.

3.7.2 Applicability within WaLTER

Explorative interpretation for the Wadden area

Due to the breadth and scope of different evaluations in the Wadden area, an integrated evaluation approach that balances scope and detail in analyses is required (Gascoigne et al., 2011). Project-based interventions in the Wadden area, (e.g. cockle fisheries initiatives, gas extraction, energy plants in the Eemshaven, a waste burning plant in Harlingen) focus on project-based empirics, and every project evaluation generally builds its own set of empirical data. Several individual project-based evaluations (e.g. the EVA II evaluation of cockle fisheries (Ens et al., 2004[21])) were heavily discussed with regard to the appropriateness of the chosen economic and ecological indicators to permit a well-founded decision based on solid empirical evidence (Runhaar & Van Nieuwaal, 2010; Hanssen et al., 2009; Swart & Van Andel, 2008). An evaluation should generally include any relevant (in)direct economic, social or environmental variables affecting the impact population's well-being. However, as many evaluations build their own empirical datasets the spatiotemporal consistency of data used in different evaluations may fluctuate. Several datasets have been developed to address the issue of spatial consistency. One relevant to the Wadden area is T-EQA, which allows for the measurement of project's biodiversity impacts. The T-EQA value of an ecosystem is basically calculated as the size of an ecosystem measured in hectares multiplied by its level of intactness on a scale of 0-100 (Sijtsma et al., 2013). Intactness is measured as the number of species characteristic for the ecosystem divided by the number of species that would be present if the ecosystem were intact. This measure of intactness may also be interacted with the relative presence of red list species. This method allows for comprehensible comparison of the biodiversity impacts of alternative development sites. In the same light, in section 5.1 we discuss the Hotspotmonitor tool which is aimed at the measurement of public appreciation for natural places, allowing for the impact population of spatial interventions in natural places to be assessed. In the Wadden area this impact population may be large, even though its low population density, given that many tourists and other visitors appreciate its nature.

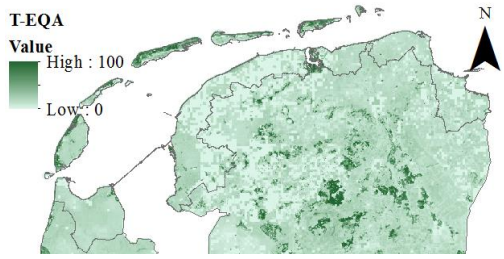


Figure 24. T-EQA for the Wadden area

Possible variables for Wadden area monitoring

Indicator
Project/policy induced direct/indirect benefits
Project/policy induced direct/indirect costs
Project/policy induced potential externalities
Impact population(s)
Well-being
Health
Biodiversity

Further reading

Sijtsma, F.J., Van der Heide, M.C. & Van Hinsberg, A., 2013. Beyond monetary measurement: how to evaluate projects and policies using the ecosystem services framework. Environmental Science & Policy 32, 14-25.

[21] In 2004 an evaluation of shellfish fishery activities in the Wadden area was delivered by Ens et al. (2004), revolving around the questions "(1) what are the ecological impacts of shellfish fishery?, (2) did the policies implemented in 1993 achieve their objectives, (3) is current shellfish fishery in line with international obligations, (4) what possibilities for improvement do exist?" (Ens et al., 2004, p.4).

4 FOUR MAIN EMPIRICAL ISSUES IN INDICATOR SPECIFICATION

4.1 Definition

The choice for a certain specification of an indicator has far-reaching consequences for its potential for analysis. This concerns both choices regarding the population which is observed and choices regarding the unit of measurement.

Regarding the population issue, it is important to identify a meaningful population and state clearly the purpose of the indicator; does it capture developments in the state of the defined population as a whole or does it capture developments in the state of a subpopulation which are an indicator for developments within the total population? Also, the definition of a population, e.g. all firms in the Wadden area recreation sector, can be subject to debate for several reasons. In the case of defining an economic sectors these reasons include that firms may employ several different market activities, which may make it difficult to decide their economic share in the recreation sector; the reason that firms sell goods and services which support both recreational activities and non-recreation activities – e.g. gas stations; and that over time new or different activities are attributed to the sector observed. In empirical analysis, the definition of a population may also depend strongly on existing classifications of observations in datasets, and its consistency over time.

The specification of an indicator regarding the unit of measurement comprises to main issues. One is the choice for a variable´s definition. Illustrative of this choice, are the implications of different measurements of regional productivity for analysis. A first choice regarding the definition of productivity is whether this should be measured from physical or financial output of production (Illge & Schwarze, 2009). Also, one could focus on labor productivity (which may be adjusted to take into account the number of hours worked) or on total (or multifactor) productivity (Kitson et al., 2004). An often used indicator is are a single years earnings per worker. For example, Agarwal et al. (2009, p.313) defines productivity as “earnings per worker (in GBP) in 2001 (PSA classification, and worker in turn is defined as economically active population – unemployed). The fact that is definition is a composite of several other definitions does have implications for monitoring practices regarding the measurement level.

4.2 Measurement level

It is effective to measure indicators at the lowest spatial (e.g. region or exact location) or functional (e.g. firm or worker) scale possible for several reasons. One is that indicators are often constructed from multiple variables (e.g. total earnings / number of workers = earnings per worker as a measure of productivity) which may be used in the construction of different indicators (e.g. the number of workers can be used to construct both a measure of productivity or a measure of economic size of a firm/sector/region). Thus a single variable can be required as an input for the construction of several indicators. A second reason is that low scale data allow for maximum insight in patterns in the data often required for detailed empirical analysis. Higher scale data may not capture heterogeneity that could be present if data were measured on a lower scale. A benefit of low scale data is that these offer flexibility in the aggregation of data to the unit of choice, without being constrained by predefined measurement units which may be subject to a change in properties over time (e.g. municipalities which merge) or units which are larger than or non-overlapping with the preferred unit of analysis. An additional spatial consideration in monitoring may be the location at which the value measured is attributed to, e.g. in the analysis of employment patterns residence- versus workplace based measures of employed persons may yield very different outcomes (Kitson et al., 2004). These differences arise from commuter flows. For instance, the share of employed persons, which in the Netherlands is measured by location of residence, does often not capture the level of employment in that area because of the net commuting flow effect.

4.3 Capturing relative performance

Although some indicators are most useful when specified in an absolute sense when describing relative performance, some indicators values need to be in some way comparable through space and/or time at a single scales. Consider the birth rate. An absolute specification of this indicator, births per municipality, would give rise to the idea that fertility is relatively high in certain areas (cities), while if scaled as births per 1,000 inhabitants of the municipality the indicator might show fairly low variation in values across municipalities. Other examples of this type of scaled indicators are agricultural production per hectare and productivity per worker. This type of scaling is often applied to economic performance indicators.

An interesting example is the location quotient (LQ) because it scaled internally (see section 2.2). This indicator serves a need arising from the many strategic policy decisions regarding economic development are determined from a regional (province level) or national perspective. Such decisions require knowing how specialized a specific area is in an economic sector compared to the relevant wider area. Consider analyzing the specialization of the tourism sector in the Wadden area. While it is clear that large shares of the economies at the island municipalities are based on tourism in contrast to relative small shares at the mainland coast municipalities, these shares do not indicate how these areas develop compared to other areas in the Netherlands. The LQ can be described as

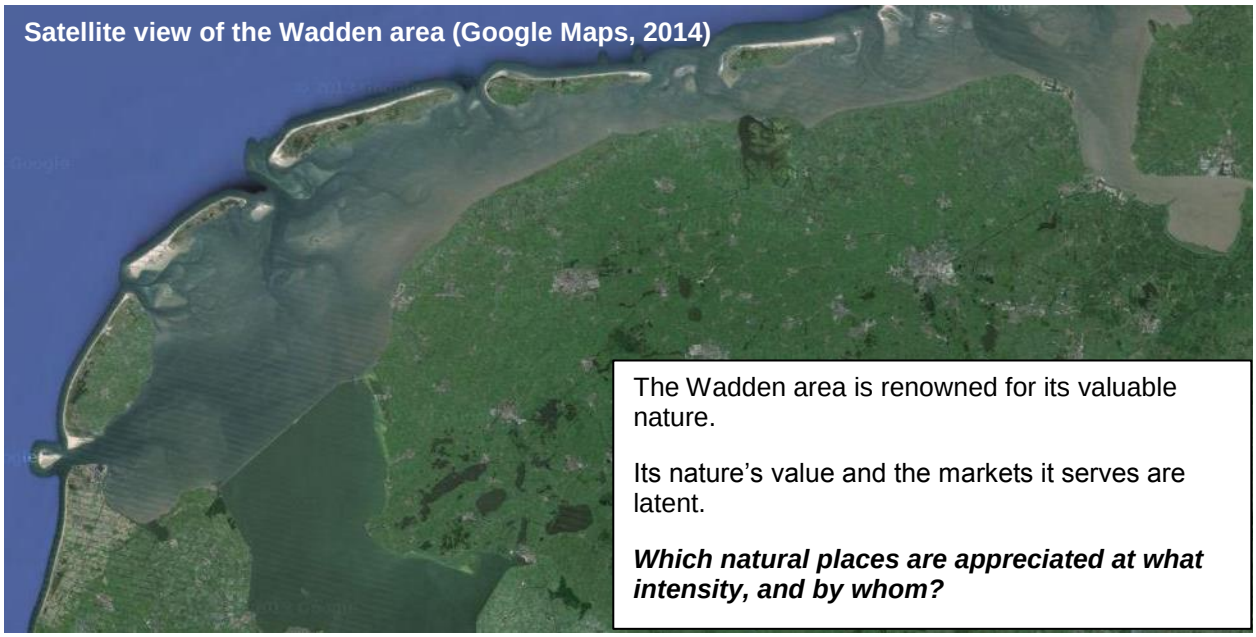
$$LQ = (ei/e)/(Ei/E) \quad (1)$$

where LQ describes the outcome of the share of the tourism sector i in a region's total economy e divided by the share of the tourism sector i in the total economy E at the national level, which serves as a reference. The relative degree of an area's specialization is given by the location quotient's deviation from 1. An LQ>1 indicates that the sector in the area observed is more specialized than the national benchmark.

4.4 Latency

Some need-to-know monitoring variables are latent, which means that these can't be observed directly – e.g. quality of life. There are two approaches to proxy latent values. One is the measurement of observable values which together form a proxy of the latent variable (e.g. the human development index as a proxy of quality of life, see sections 3.1 and 3.2). The second approach is the measurement of subjective judgments regarding the latent variable. The latter approach can for example be used to identify which nature in the Wadden area is most appreciated, since this may not be derived from objective variables (land use types, biodiversity) efficiently. Economically latency is a main characteristics of the value of public goods and services. For these goods and services no clear market exists, and similarly, in theory the supply of certain services may also not be apparent. Consequently the value of these public goods and services is difficult to compare with the value of market goods since there is no observable utility bearing unit to which a price for consumption can be attached. Several empirical techniques, based on either stated preferences or revealed preferences, exist to estimate the value of public goods. The application of most of these techniques requires too much effort and technical assumptions (subject to change over time due to furthering in empirical skills) to be incorporated in a long-term monitoring system. An exception is the technique of surveying subjective judgments, which can be very useful in the systematic monitoring of key indicators of socioeconomic development in the Wadden area, quality of life, economic competitiveness and nature preferences.

5 THREE GAPS IN LONG-TERM INDICATOR-MEASUREMENT

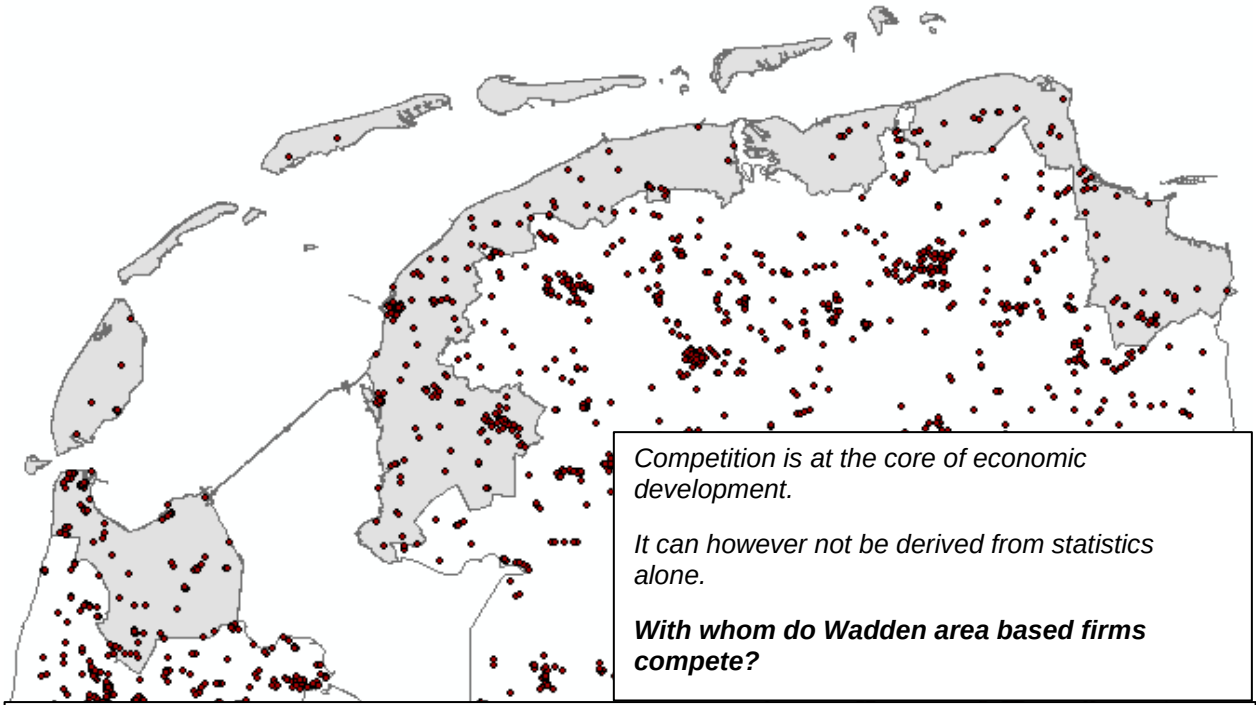


The Wadden area is renowned for its valuable nature.

Its nature's value and the markets it serves are latent.

Which natural places are appreciated at what intensity, and by whom?

- **Companies manufacturing steel products (LISA, 2011)**



Competition is at the core of economic development.

It can however not be derived from statistics alone.

With whom do Wadden area based firms compete?

Does the Wadden region provide for the needs and requirements of its citizens?

Existing regional statistics do not capture local experience and knowledge.

What is the 'soft' local context of liveability?

5.1 Identifying appreciated nature: the Hotspotmonitor

Natural capital is a major factor in the regional development of the Wadden area, which is renowned for its highly appreciated nature (Sijtsma et al., 2014b). The public's appreciation of nature is, however, latent. This impedes the substantiation of choices for spatial development or conservation alternatives. Indeed, the public value of different natural spaces needs to be taken into account, as well as the population which is impacted by the development or conservation choice made. Such social value of nature can be taken into account in cost benefit analysis or environmental impact analysis using the data generated by the Google Maps-based Hotspotmonitor (HSM) survey tool (see De Vries et al., 2013 and www.hotspotmonitor.eu). This tool is developed by the University of Groningen, PBL Netherlands Environmental Assessment Agency, Alterra which is part of Wageningen University, and the Ontwikkelfabriek. The central question for respondents in the Hotspotmonitor is the following: Which places do you find very attractive, valuable or important? And why? Respondents are instructed that places may be 'both within or outside a city or village. The only condition is that places should be green and/or include water or nature.' Then respondents are asked to mark the natural place they find most attractive on a map. This step is conducted three times separately to determine the most attractive natural places on local (within 2 km from home), regional (within 20 km from home), and national spatial scale. The share of markers an area receives out of the total set of markers placed is considered to indicate its relative social value. The Hotspotmonitor may be understood as a SoftGIS approach (Kytta, 2011) as a 'value mapping' technique (Raymond and Brown, 2007) and as part of the trend to integrate the possibilities of Geographical Information Systems (GIS) in cost-benefit analysis (see Bateman et al. 2005). An illustration of the steps in the HSM survey is provided below, as well as some examples of analyses allowed by HSM data.

Step 1: The respondent enters his/her postal code, and is placed on the map at that location

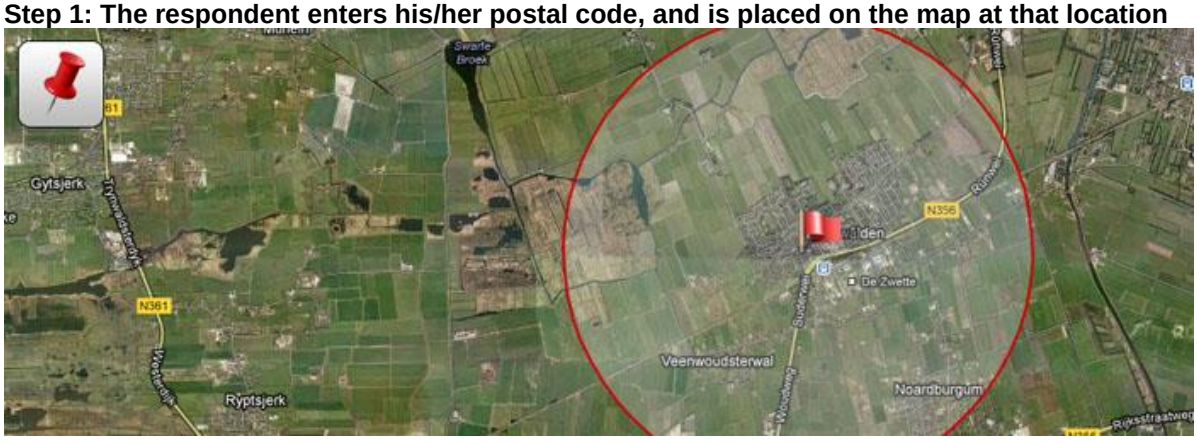


Figure 25. A flag marking the residential location provided by the respondent

The flag indicates the respondents living location (approximated by the postal code). The red circle indicates the search area of 2 kilometers within which the local marker may be placed on the map to mark the most attractive natural place at local scale.

Step 2: The respondent marks and motivates his or her most attractive natural places at local / regional / national / international scale consecutively

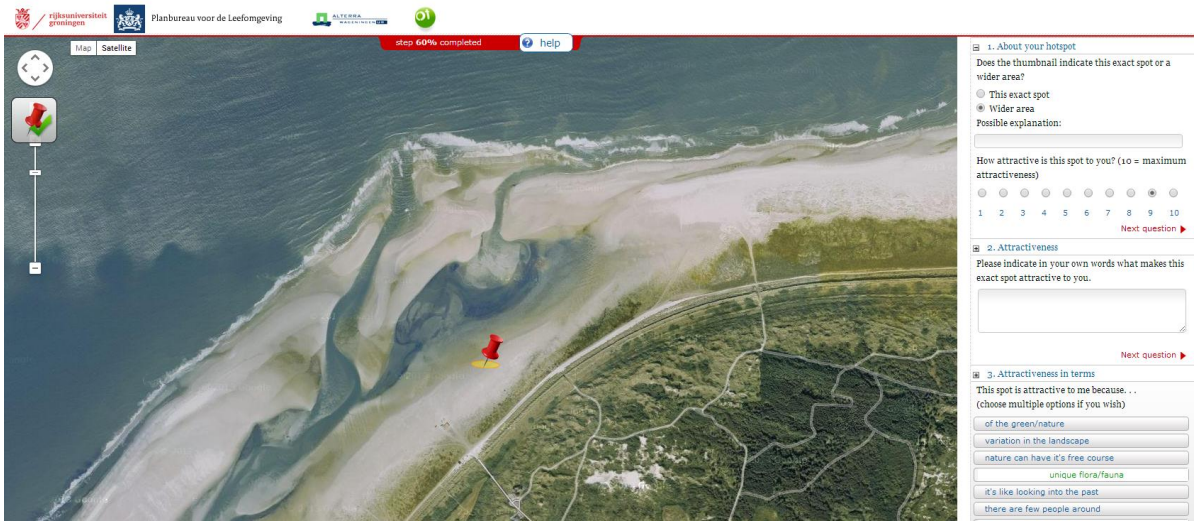


Figure 26. A marker placed at the national scale, pinpointing the beach of the island of Schiermonnikoog

The respondent first marks the most attractive natural space at local scale. Dragging and dropping of the marker, zooming, and searching for locations are possible during this process. After the marker has been placed on the map a window appears, showing several question about the place marked which are aimed to identify what motivates the respondents appreciation of this particular place or larger area. These include an open question, several closed questions, and recreational behavior relation questions. After finishing all the questions about the place or area marked at the local scale, the process described above is repeated consecutive at the regional and national scale.

Step 3: Identification of respondents demographic characteristics and social values
During this step respondents are asked about their age, gender, education level and their household type. These variables allow for sorting in the appreciation of places and the activities employed there to be examined. After these questions are answered respondents are asked to answer a set of questions regarding their social and personal values which are their guiding principles in life. Answer-possibilities are ratings at a Likert scale of 1-5. After this step the survey is completed.

Relevance of nature appreciation as an indicator
Natural capital is a major factor in the regional development of the Wadden area, which is renowned for its highly appreciated nature. However, as shown by figure 27, data describing land use types do not capture the variation in the public's appreciation for nature. Relative differences in the amount of appreciation different areas receive correlate strongly with employment levels in the Wadden area's tourism sector (Sijtsma et al., 2012). However, although employment is a major indicator in indicating socioeconomic developments related to tourism, it is often located in or near a village at some distance of its driver in many case; nature. Also, the Lauwersmeer area is highly appreciated although the size of the local tourism sector is small. Because appreciation for nature may shift spatially, and because it is a major driver of the Wadden area's regional economy, it is an indicator of major importance in understanding socioeconomic developments.

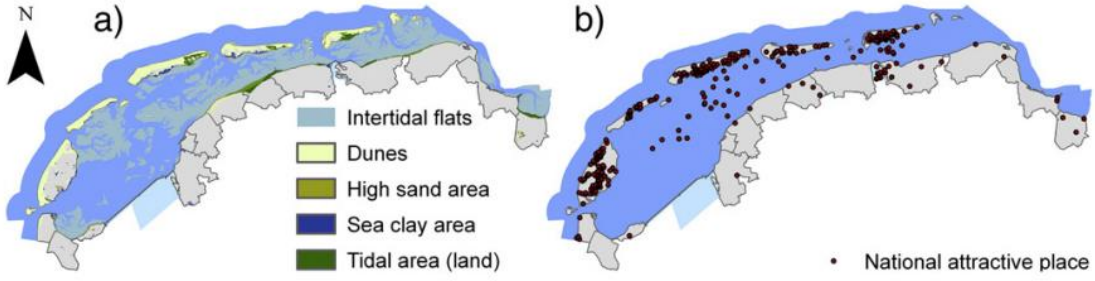


Figure 27. a) Land use types; b) Distribution of 320 (out of 1800) national Hotspotmonitor markers across the Wadden area (Source: Daams & Sijtsma 2013, p. 160)

The measurement of appreciation of nature in the Wadden area also serves the weighing of public (and private) interests when developments affecting the stock of nature are considered, for two main reasons. One is that information regarding relative differences in the public's appreciation and underlying motivations of appreciation of natural places can improve trade-off decisions. Secondly, information about the residential locations of those who appreciate Wadden area nature improves the identification of the impact population of development (alternatives) considered. This is relevant for policy or development decisions the Wadden area especially since the Wadden area's nature does not only serve local residents (approximately a quarter million in number in 2009) needs but also the needs of millions of visitors from other regions. Unlike residents, who can generally be identified as part of the impact population rather effortless, consumers of Wadden area nature from elsewhere are difficult to identify. Since there are many visitors who enjoy the Wadden area's nature it may be relevant for certain policy or development decisions to include their interests in the assessment of trade-offs.

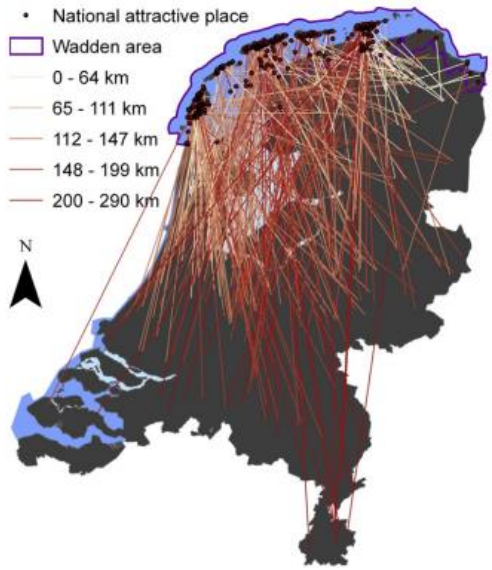


Figure 28. (Left) Euclidean lines connecting national attractive natural places to the residential locations of the respondents who marked these places in the Wadden area (Source: Daams & Sijtsma 2013, p.160)

The delineation of nature conservation areas in the Wadden area is based mainly on ecological motivations. Their coverage may not correspond with areas appreciated for recreational values. Figure 29 provides an illustration of clusters of national hotspot markers, based on a procedure discussed in De Vries et al., (2013), indicating areas that are highly appreciated by the surveyed public.

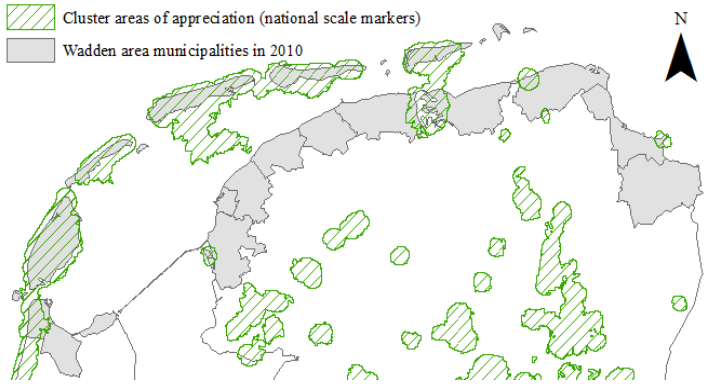


Figure 29. (Right) Clusters of national scale appreciation

5.2 Understanding regional competitiveness: entrepreneur panels

Competition is at the core of regional economic development. This is illustrated best by the discussion of conceptual models in section 2.1, a regional economy by Armstrong and Taylor, and 2.10, Porter's five forces of competition. A competitive positioning of Wadden area based firms can support a long-term stable or upward economic development of the region. Yet, systematic assessments of competitive relations between (Wadden) firms seem absent from socioeconomic monitoring schemes. Below we propose how monitoring can account for this need-to-know variable.

In section 2.10 a light is shed on competition between firms by addressing the most relevant variables at play. These variables revolve around five forces of competition described in Porter (2008), which are:

- rivalry among existing competitors;
- bargaining power of suppliers;
- bargaining power of buyers;
- threat of new entrants;
- and the threat of substitute products or services.

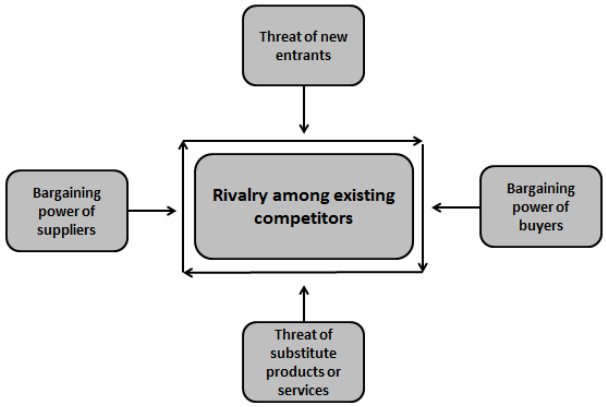


Figure 30. The five forces of competition (Source: Porter, 2008, p.27)

Clearly, rivalry, power-relations, potential entrants to the market, or substitutes may not be derived from regular statistics. This is due to their latent character. So, how can statistics identify how the power of mussel fishers within the *supply chain* has developed over time, or whether a steel producing company competes with the nearest similar company or a company in India? If indicators are used for answering such questions, deriving useful answers from these indicators would require either a substantial level of interpretation, or a substantial amount of indicators which may hamper a coherent interpretation. A traditional indicator approach to understanding competition therefore doesn't seem useful support to understanding developments in the competitive positioning of firms in the Wadden area. In contrast, following the rationale of Porter's (1990; 2008) research strategy, which was built on surveying entrepreneurs, panels of entrepreneurs who gather on an annual base may contribute strongly to the understanding of current and future developments of economic activities in the Wadden area.

An annual entrepreneur-panel gathering could be used to derive information about developments affecting the competitiveness of the most important sectors and individual firms in the Wadden area. In doing so, a focus on the five forces of competition described by figure 30 is useful. In addition, the spatial scales at which competitive relations exist should be identified to identify economic structures which may be addressed by regional economic development policy. Indeed for policy formulation it is relevant to identify whether a sector competes at a local market or an international market, and how many buyers needs are served in which regions.

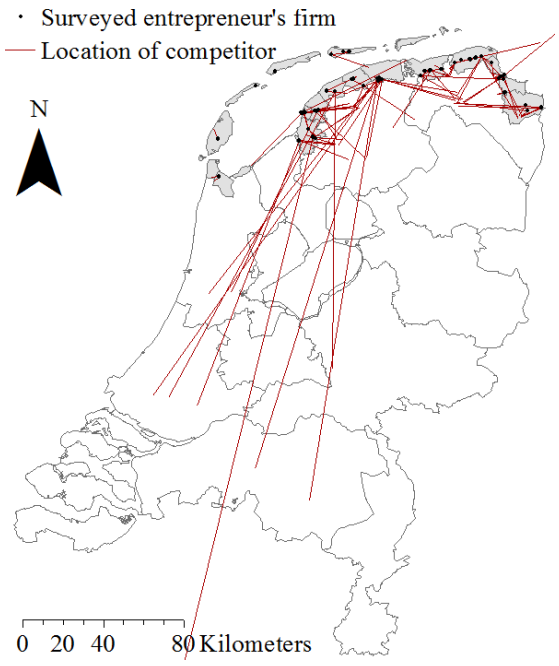


Figure 31. lines indicating the location of the most important competitor of surveyed entrepreneurs firms. The results underline that the Wadden area's economy is embedded within larger regional, national and even international economic structures of competition. The source is data from a pilot survey carried out by Bachelor students of the University of Groningen in 2012. In this survey 263 entrepreneurs were asked to describe three firms most important rivalling to their firm, the spatial extent of the market which needs their products or services serve, and the locations of their suppliers and buyers.

5.3 Monitoring regional liveability: inhabitants panels

A contribution by Nora Mehnen (RUG) and Richard Rijnks (RUG)

The structural evolution of the economies and the rural society is often negatively characterized by the decline of the dominating productive activities (agriculture and industry), the departure of the young and most qualified people towards the urban centres to study or to find a job, the arrival of pensioners which come to intensify the ageing of the rural population, and a decline in the level of service provisions to the population such as post offices, banking agencies, public transport, schools, cribs, etc (Brulard et al., 2008, p.1). These processes influence and are influenced by the degree to which the region provides for the needs and requirements of its citizens, known as liveability (Veenhoven, 1995). Some of the Wadden Sea municipalities have to cope with such processes. But the effects of small-scale developments such as a closing of a school are difficult if not impossible to identify in the available statistical data. In addition, current liveability indicators at the municipal level incorporate assumptions about the spatial structure of the region which, although largely unproblematic across the nation, are unlikely to be met in a spatially fragmented and dispersed region such as the Wadden Sea. Therefore the aim of a panel with inhabitants is to make the specific local effects of such developments visible and to learn from their experiences and use local knowledge.

Datasets from the Dutch municipal administration and Statistics Bureau Netherlands provide a variety of regional statistics at relatively small spatial scales including demographics, house prices, and socio-economic composition of neighbourhoods. Hence, important key indicators for the liveability of the Wadden area are existing and accessible.

However, WaLTER notices a gap in important areas. First, these data consist of national surveys, meaning the data collection, processing, and distribution require some time. Population statistics show outcomes of household decisions, for example when households left and where they went, and are made available some time after this decision was made. From a policy perspective it is more important to keep a finger on the pulse before such a decision is made. What are the problems experienced: is it the quality of the school or perhaps travel times to work? A monitor which is continuously up to date regarding the key issues in terms of liveability is a key requisite for anticipatory, strategic policy. Second there is too little insight into the competitiveness of the Wadden area in terms of a living area. The Wadden area as a mainly rural area competes with other areas (Thompson & Ward, 2005), both rural and urban. It is important for the socio-economic sustainability of the Wadden area to monitor whether or not the area remains attractive to prospective migrants, and for whom the area is most attractive. The specific nature of the Wadden area as an attractive area and tourist hotspot will determine in a large degree who moves from and to the area, and discrepancies between the islands and the coastal regions in terms of popularity might be instrumental in explaining socio-economic outcomes (see Bijker, 2013; Bijker *et al.*, 2012).

To fill in the abovementioned gap, WaLTER is conducting a pilot study, focusing on repairing these two shortcomings in the current monitoring activities. Two pilot studies have been conducted until now:

- LBF: a first pilot in the province of Friesland in The Netherlands together with Partoer, a planning and research firm. A brief overview of the types of empirical data gathered in this study are displayed below.
- LBM: a first trilateral pilot conducted in combination with Bachelor students of the University of Groningen. The topics the students chose to focus on range from studies into the liveability of the elderly (accessibility), or youths (de-greening of the population) on the islands, transport and accessibility, satisfaction with governance and participation for windfarms and place-branding, cultural differences between coast and islands, the effects of second homes on the environment, tourism, and the perceived benefits or constraints from the designation of the UNESCO World Heritage region.

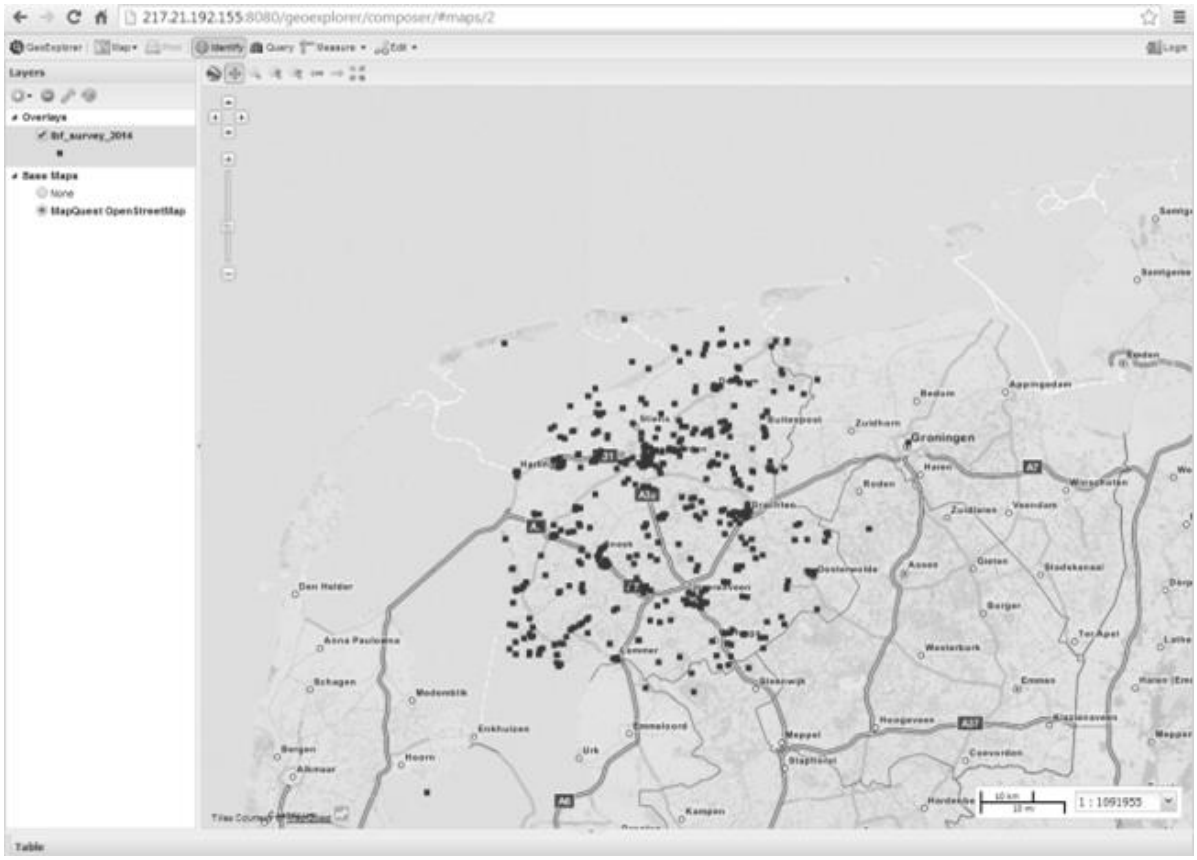


Figure 32. This figure shows attractive places marked by respondents of a similar Liveability monitor but for Friesland (LBF), as places they would show to visitors, family and friends. In addition, ideas for improvements were mapped by the participants. The ideas cover all kinds of ideas from 'everything should be as it is' to 'I hope that there will be less vacancies of buildings' or 'more sport facilities' or 'a local supermarket'.

6 SPATIAL ECONOMIC ECOLOGICAL DATABASE (SEED)

Spatial Economic Ecological Database (SEED) is an online tool aimed to support a shared understanding among planners and experts of the economy and ecology of the Dutch Wadden area. It is developed as a product of the WaLTER project and will in 2014 be available for public use. SEED contains a comprehensive set of stakeholder validated spatially-explicit GIS data on key economic and ecological indicators. These data extend over various spatial scales. The purpose of the SEED is to integrate basic economic and ecologic information in order to support the resolution of specific (policy) questions and to facilitate connections between project level and strategic level in the spatial planning process. Although modest in its ambitions, a Wadden SEED can serve as a valuable element in the much debated science-policy interface. A Wadden SEED is valuable since it is a consensus-based common knowledge base on the economy and ecology of the Wadden area which is rife with ecological-economic conflict, including conflict in which scientific information is often challenged and disputed.

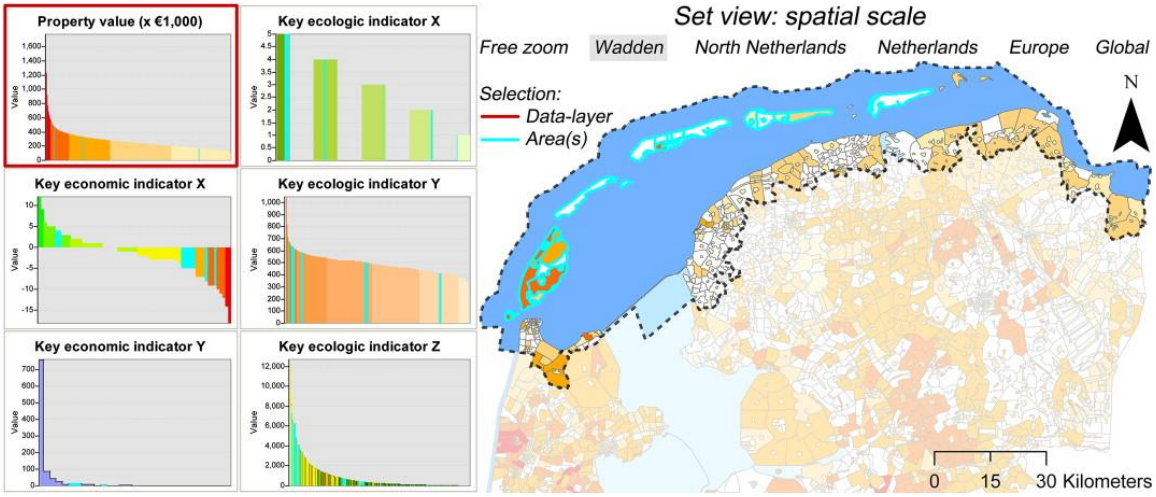


Figure 33. SEED presents indicators in a user-friendly interface that combines a GIS-viewer with a so-called 'dashboard' of graphs of indicators from which to select specific samples to highlight for the viewer (Source: Daams & Sijtsma 2014, p.162)

The SEED's GIS-data layers give insight into the variables key to a basic understanding of the economy and ecology of the Wadden area. The power of GIS can be used to enhance the interpretation of data layers at different spatial levels. These layers are thematically grouped by the Wadden area's main economic sectors and key economic and ecologic drivers and assets (e.g. agricultural, industrial and tourism sectors, mussel beds, bird foraging areas).

Data provision in the spatial database is question-driven: it answers so-called 'central questions' about the competitiveness of the Wadden area on a specific subject. An example of a central question could be "where do people want to live?" This question can then be answered by a minimized set of core-indicators that provide the 'best answer' to the central question, and allow the spatial database to remain understandable.

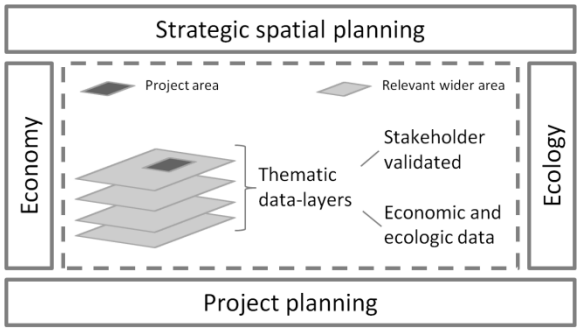


Figure 34. A conceptual sketch of SEED (Source: Daams & Sijtsma 2014, p.161)

A data base by itself may not be adequate at yielding understandable spatial insights into variables relevant to comprehension of a specific subject. Therefore stakeholder validation of the spatial database and the choice of data is key. Do the data and relations visualized in the SEED fit their purposes? Are the SEED's specification and the database's layers easy to understand by stakeholders involved in the planning process? Is there consensus among experts that the appropriate data are used to answer a policy question? Such concerns are answered in validation sessions with experts and other stakeholders from the public and the private sector. The feedback given during these validation sessions, if scientifically reasonable and practically feasible, is used to improve the spatial database's specification and its data contents. Once again, these are modest aims; this process cannot prevent or solve every conflict, nor can it provide complete understanding to everyone: but it can give a basic and shared understanding to many people.

Key variables of a Wadden SEED should be publicly available. The most straightforward option to accommodate these two concerns seems to be the availability of an online SEED. A web-based structure offers the opportunity to present data on dashboards in interactive graph format that e.g. permit a simple analysis of the spatial distribution of the values of mapped variables. A first version of the online SEED will air in 2014 as a product of the WaLTER project.

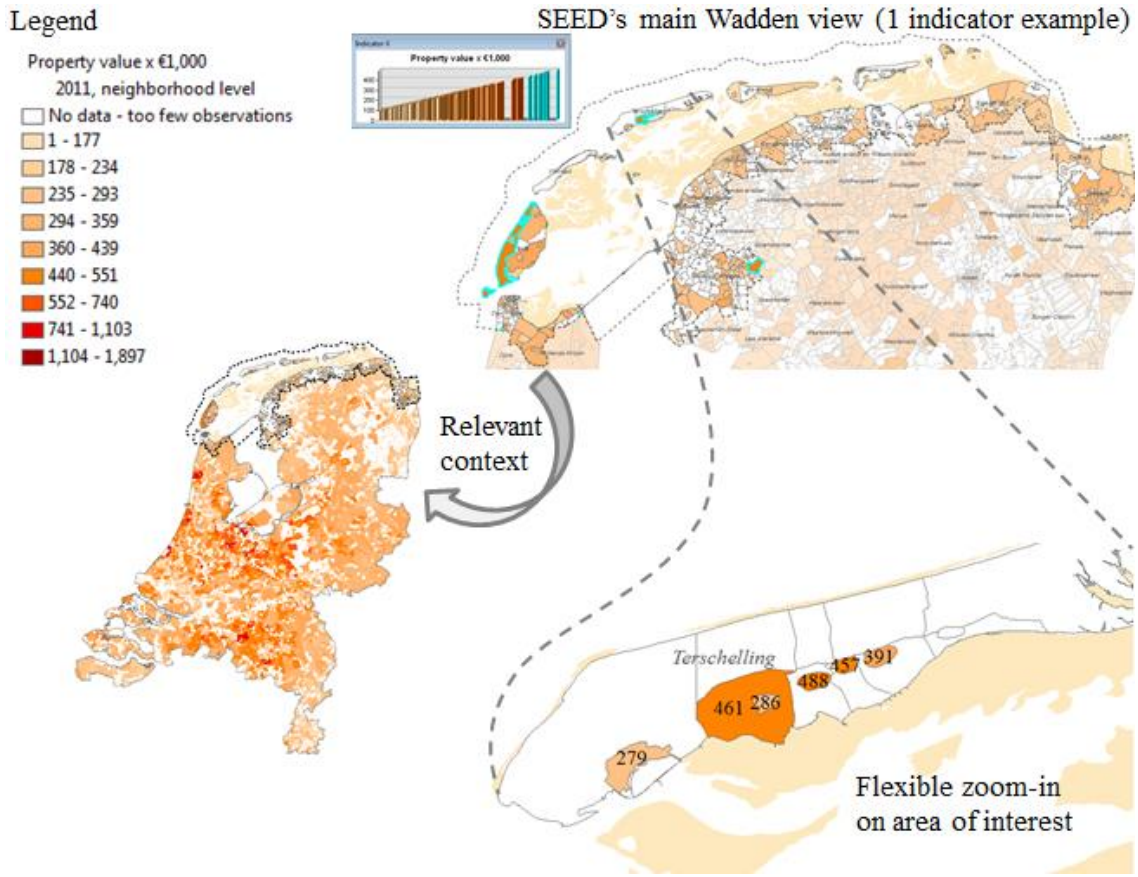


Figure 35. Illustration of the Wadden SEED. The figure shows one example indicator (mean property value at the neighborhood level). In the top right the figure shows how in a graph the observed neighborhoods with the highest property values are selected, highlighting these observation, including Terschelling, on the map. In the bottom right of the figure the result of a quick zoom-in on the SEED data for Terschelling is given, allowing to assess the mean property values at the island in more detail. In the left area of the figure a map of mean property values in all Dutch neighborhoods is shown. This map can be easily scrolled to within the online SEED to allow for comparison of property values in the Wadden area with those in the rest of the country.

Further reading

Daams, M.N. & Sijtsma, F.J., 2013. Planting the SEED: towards a Spatial Economic Ecological Database for a shared understanding of the Dutch Wadden area. *Journal of Sea Research*, forthcoming.

7 SYNTHESIS

This report is aimed to contribute to the understanding of the Wadden area's regional development, integrating social and economic thinking. The regional economy is treated as a mechanism consisting of three interconnected markets, which are the labor market, the housing market, and the tourism market. Developments in these markets are mainly the result of competition and government regulation. The outcome of regional development may be regarded as a change in the quality of life, which may apply to the Wadden region's residents, incoming commuters, and visitors. Core indicators relevant for understanding socioeconomic development of, and within, the Wadden area have been identified. Three main issues in the specification of socioeconomic indicators which are identified throughout this report are discussed, and summarized in bullet-points, below.

7.1 Integrating socioeconomic and ecologic values: theory and management

It is conventional knowledge that in the development of the Wadden area socioeconomic and ecologic values are tightly connected. A conceptual oversight is provided in the discussion of socioeconomic and integrative models in this report.

It is apparent that few conceptual models take externality effects from socioeconomic activities on ecosystems into account explicitly. These include extended input-output models, sustainable development models, and ecological economic models. Most models treat ecosystems as a production factor only. Such one-way relations between ecosystems and the socioeconomic system often include ecosystems providing raw environmental goods as an input for production or ecosystems providing services such as an attractive scenery that may capitalize in house prices, as can be measured with hedonic price models. It is, however, obvious that in order to fully understand socioeconomic developments in the Wadden area a wider notion of economic development, including feedbacks with ecosystems is useful since these are major drivers of parts of the Wadden area's economy.

The relations between economy and ecology most important to understanding the development of the Wadden area are concentrated mainly in a few sectors, energy production, fisheries, and tourism. It should, however, be noted that economic growth does not necessarily affect ecosystems significantly. The largest economic sector in the Wadden area is the service sector, and a considerable share of its activities is concentrated in offices. Also, many inhabitants of the Wadden area commute to work in urban areas, and thus spend their time with their backs turned towards the Wadden Sea.

- In the report several indicators are proposed which are aimed to capture the potential economic production-driven degradation or improvement in ecosystems ability to serve human needs.
- Also, several indicators are included which capture the value of nature to socioeconomic development, e.g. through recreational services provided.
- In section 6 the policy-support tool SEED is discussed. SEED is aimed to support an indicator-based shared understanding among planners and experts of the economy and ecology of the Dutch Wadden area. Hence, SEED can be an important public platform. Anyone can contribute in the discussion on which indicators are optimal, as well as which data could be used, or how SEED can be improved in general.

7.2 Understanding developments in the Wadden: why geography matters

In the introduction it is introduced that in this report the Wadden area is defined as consisting of the Wadden Sea and all adjacent municipalities. The choice for adjacent municipalities outer borders as the Wadden area's outer borders on the mainland is subjective yet practical because these are the spatial units in which local influence on the management of the area is concentrated.

However, several conceptual models emphasize that indicators describing purely the state of variables at the local scale, e.g. exports by local firms, need to be complemented by indicators which include a benchmark with a larger economic structure, e.g. the international market share of the exporting firms, for socioeconomic development in the Wadden area to be understood adequately. Adding to the complexity of defining adequate indicators, firms products may serve needs at different markets; consider a mussel fisher selling mussels to both local restaurants and to distributors who sell to Belgian or French restaurants. Different market-segments may be characterized by very different levels of competition and thus have different implications towards the competitive positioning of firms. Similarly, well-being in the Wadden area may not necessarily be a result of conventional economic growth, but relate strongly to its economic tie-in with nearby urban areas which offer employment opportunities to Wadden area residents.

Apart from these multi-scale dynamics, models differ in the level of spatial detail at which socioeconomic development is considered. Several models can build on regional data. However, the definitions of regions (e.g. through municipal mergers) are subject to change through time, and the unit of analysis may deviate from more natural socioeconomic units. Essentially, the conceptual models reviewed build either on variables that capture information at actor level, whether this is a firm or a household, or on variables which are aggregates of the former.

Also, it is apparent that the connection between the socioeconomic system and the environment through land use and externalities requires spatially explicit data to be understood thoroughly. Consequently, it seems logical to monitor at the lowest scale possible.

- An indicator-based understanding of socioeconomic development in the Wadden areas requires the assessment of two types of indicators. One consists of indicators describing the local state of a variable, the second type comprises indicators which indicate multi-scale relations with external areas and benchmarks which describe a relative performance of the Wadden (sub)area compared to external areas.
- Indicators should be measured at the lowest scale possible, to allow for both spatially explicit analysis and flexible aggregation in support of regional analysis.

7.3 Main gaps in long-term indicator measurement

The models reviewed in this report indicate that economic development is determined mainly by competition, and that the competitive advantage of rural areas should be based on immobile resources. The main immobile resource of the Wadden area can be argued to be its unique and attractive nature. Both of these major factors in the economic development of the Wadden area, appreciated nature and competitiveness, as well as their livability outcome, share a property which hampers the capturing of their development in conventional indicators; latency. Neither of these three variables can be observed directly. Perhaps it is for this reason that the measurement of indicators describing either competition, the appreciation of nature, or livability with respect to the Wadden area seem to be absent in current monitoring practices. Yet these variables are key to understanding the development of the Wadden area.

In section 4.4 it is discussed how latent variables can be approximated using either objective or subjective measures. Since objective indicators may not efficiently capture competition or the appreciation of nature, for both subjects an alternative monitoring tool is proposed in section 5. To uncover competitive relations which drive economic development in the Wadden area an annual entrepreneur panel gathering is proposed to discuss the situation and developments for key sectors. Important is that existing statistics do provide a complete knowledge base that could support such discussions. An important innovation would be the monitoring of economic relations of Wadden firms within their respective supply chains, to reveal the economic structure in which firms operate. Another important gap in current monitoring is the measurement which nature in the Wadden area is appreciated, why, and by whom it is appreciated - uncovering the spatial markets served by Wadden

nature using the Hotspotmonitor tool is proposed in this report. And last, although livability is of large importance to socioeconomic development in the Wadden area, especially given population decline in particular reasons, this is currently not measured adequately. Surveys seem necessary to identify how people in distinct areas perceive local livability, and how this ties in with their spatial behavior (e.g. where do they work? Where do they travel to consume services or buy goods?). The abovementioned tools help to fill gaps in existing Wadden area long-term monitoring practices.

- The main drivers of economic development in the Wadden area, competition and appreciated nature, are not measured (efficiently) by current monitoring practices.
- To fill important gaps in indicator measurement three innovative means are proposed. The first consists of annual Wadden entrepreneur surveys combined with measurement of supply chain relations to uncover the economic situation in which firms operate. The second is the measurement of local livability in relation to Wadden inhabitants' spatial behavior. The third is an online survey tool, named the Hotspotmonitor, which can measure the intensity of public appreciation of very particular places in nature and from which regional 'markets' this appreciation originates – where precisely do (international) 'fans' of the Wadden area live?

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