



## Coastal Protectionist Argument

### PRO dike strengthening:

Dikes offer the best flood protection possible. Because of rising sea level, dikes have to be elevated in order to prevent future flooding.



## Coastal Protectionist Argument

### PRO sand supplementation:

Sand supplementation protects sandy coastal areas, such as beaches and dunes, which are largely exposed to strong surf. Sand supplementation can maintain the coastline.



## Coastal Protectionist Argument

### PRO intensive coastal protection:

Numerous jobs are a result of coastal protection in an economically weak region, where agriculture and fisheries are becoming less important. The more coastal protection activities take place, the better for the region.



## Coastal Protectionist Argument

### CONTRA sand supplementation:

Only solid constructions made of concrete and stone can protect the coast in areas of strong erosion. If one really wants to, every coast can be secured with steel and concrete.



## Coastal Protectionist Background



One of our constitutional basic human rights is the preservation of life and property. The protection of human life always has priority. A total of 3,7 million people (year 2000) live in the coastal regions of the Wadden Sea and another 2,6 million people live in large cities on the German coast. In addition to the security of inhabitants, dikes also protect valuable real assets, such as buildings, streets and vehicles.

## Coastal Protectionist Background



The west beach of Sylt only exists today because large regular sand supplements replace the sand that has been lost. Without them houses such as the famous "Haus Kliffende" wouldn't exist any longer and the beach would be narrower.

## Coastal Protectionist Background



Each year in Schleswig-Holstein 40-45 million Euros are spent on the coastal protection of the North- and Baltic Sea. The necessary expenditures are small in comparison to the economic value and human lives protected. On the Hallig islands, people can often only live there, because they are employed by the coastal protection agency.

## Coastal Protectionist Background



Beach nourishments often have to be repeated because the sea carries away the sand. In years with strong storms it may happen that a sand depot worth millions is washed away completely. Solid coast protection buildings are more expensive but last longer.



## Agriculturalist Argument

### PRO dike strengthening:

The maintenance and strengthening of today's dikes is the most cost-effective and most sensible way of preserving valuable farmland. If necessary we should sacrifice foreland salt marsh areas.



## Agriculturalist Argument

### CONTRA managed dike realignment:

When dikes are opened the most valuable coastal farmlands are lost, because they are abandoned to the North Sea.



## Agriculturalist Argument

### PRO priority for humans:

The North Sea islands and Hallig islands are the basis of existence for numerous farmers and at the same time they are an important protective barrier for the whole Wadden Sea region. For this reason maintaining the islands and holms must be given high priority.



## Agriculturalist Argument

### CONTRA sand supplementation:

Beach nourishments are expensive and are paid from the same EU-fund as agriculture is. Before coastal engineers take the money from us to sink it in the sea, they should rather cover more sandy coasts with concrete.



Agriculturalist  
Background



Agriculturalist  
Background



Agriculturalist  
Background



Agriculturalist  
Background



Dikes today are much higher and wider than in the past. If elevated, areas before and behind the dike have to be built over.

It is the farmlands close to the dikes that have the highest yields because of the good quality of the soil and easy drainage.

The islands and holms can be considered flood protection for the mainland, because the waves are first broken by them before reaching the coast. Solid dikes and stone fortifications can maintain them even when surrounding tidal flats submerge and tidal gullies become deeper.

The EU pays substantial parts of coastal protection from their fund for "agricultural structure and coastal protection". The countries pay a minor share, islands and coastal communities don't pay at all for coastal protection measures.



## Nature Conservationist Argument

### PRO managed dike realignment:

Tidal flat areas will be reduced as a result of sea-level rise. They should not unnecessarily be further reduced by additional embankment activities. On the contrary, tidal flat area should be reestablished by controlled dike openings at appropriate locations.



Nature Conservationist  
Background



## Nature Conservationist Argument

### PRO holistic coastal protection:

With rising sea levels we are going to lose tidal flats and salt marshes even if we maintain the islands and dikes with concrete. We need a coastal protection concept which promotes the natural rise of the whole Wadden Sea.



Nature Conservationist  
Background



## Nature Conservationist Argument

### PRO sand supplementation:

Coastal protection measures using concrete, stone or asphalt seldom offer living space for typical Wadden Sea animals and plants. Instead of intensive coastal protection measures the building of dunes and salt marshes should be promoted using sand supplementation.



Nature Conservationist  
Background



## Nature Conservationist Argument

### PRO sand supplementation:

Only with lots of additional sand being added to the system will we be able to protect the islands and tidal flats from rising sea levels. Areas which are now concrete could even be return to nature.



Nature Conservationist  
Background





## Tourism Manager Argument

### PRO dike strengthening:

In the tourist industry a high financial risk is made when investing in a hotel or something similar. These risks must be minimized by building secure dikes.



## Tourism Manager Argument

### PRO managed dike realignment:

Since 2009 the German and the Dutch portions of the Wadden Sea together are considered a World Heritage Site of the UNESCO. Therefore we must maintain this special place and valuable ecosystem for future generations. Dike openings, which maintain tidal flats, are therefore beneficial.



## Tourism Manager Argument

### PRO sand supplementation:

Sandy coasts, which are very popular among tourists, are especially endangered by strong wave action. Wave action will probably intensify as a consequence of climate change. In order to maintain the coast in the natural form, sand supplementation must therefore be carried out and increased.



## Tourism Manager Argument

### PRO holistic coastal protection:

A new type of landscape with flood polders and artificial sandbanks would offer tourists new scenic attractions. They would even be unique world wide and could attract additional guests.



Tourism Manager  
Background



Tourism is the most important regional economic branch. Twenty percent of the jobs and the economic strength of the region are dependent on tourism. Schleswig-Holstein took third place in a 2007 survey of the most visited inland travel destinations of Germany.

Tourism Manager  
Background



In 2009 the Dutch and German portions of the Wadden Sea were declared a World Heritage Site. In order to maintain the touristic importance and nature protection value of the Wadden Sea, the loss of tidal flat areas must be prevented. To offset rising sea levels one should open a few dikes and controlled flooding of smaller areas should take place.

Tourism Manager  
Background



The coasts of many Frisian islands could only be maintained because since around 1980 regular sand supplementations were carried out. Furthermore, it was possible to maintain and strengthen dunes by sand supplementing offshore of the beaches.

Tourism Manager  
Background



Behind the dikes large areas of land were previously tidal flats. If one were to plan carefully here, fresh-water lakes and tidal flats with connection to the sea could develop as a paradise for water sports, water birds and tidal flat organisms. Touristic income could pay for agricultural losses.



## Coastal Protectionist Argument

### PRO dike strengthening:

For centuries coastal protection has been continually developed. Certainly it will be able to master any new challenges facing it. The threat caused by rising sea levels must be met above all by investing in dike expansion and improvement.



Dike construction has developed enormously over hundreds of years, from the first low dikes to modern dikes 9 m high. Dike profiles have been continually improved. No floodings have taken place since 1962 only because of the progressive increasing of the dike height. This must be continued since future storm floods will be higher as a result of climate change.

Coastal Protectionist  
Background



## Coastal Protectionist Argument

### PRO sand supplementation:

It is an extremely difficult task to protect beaches from erosion, because you cannot hold sand in place. Shoreline stabilization measures consisting of concrete or stone are often eroded from below, whereas sand supplementation replenishes the beach, if repeated often enough.



On the island of Vlieland there was extreme erosion at the edges of the stone groynes, which was why the groynes had to be removed. Groynes are too stiff and influence the currents so that sand erosion is partly increased. Coastal protection measures without solid construction, such as sand supplementation are more successful. Sand supplementation has taken place on all of the Dutch islands since 1990. In this way further loss was stopped.

Coastal Protectionist  
Background



## Coastal Protectionist Argument

### PRO priority for humans:

Effective protection measures have to encompass the whole coastal area. This includes the construction of dams, artificial islands or storm flood barriers. The more flood waters are regulated, the lower the risk for man.



A best practice project is the Zuiderzee Barrier on the northern coast of Holland. The dams have a total length of 34,5 km and close off an area of 1100 km<sup>2</sup> from the sea that is no longer influenced by the tides or storm floods. Many cities, such as Amsterdam, are situated protected on the IJssel Sea, the new inland lake.

Coastal Protectionist  
Background



## Coastal Protectionist Argument

### PRO priority for humans:

Modern dikes are extremely wide and flat, so that the storm flood waves lose their power without damaging the dikes. The foreland salt marshes must also be used in order to widen dikes and to obtain the building materials necessary for expanding the dikes.



When the height of dikes has to be increased, likewise the dike base has to be widened covering areas before or behind the dikes. The material for building the dike has also to be taken from somewhere. Because the sea continually deposits new sediment on the foreland areas, we should take the building material for the dikes from the forelands and extend the dikes in this direction as well.

Coastal Protectionist  
Background







## Agriculturalist Argument

### PRO dike strengthening:

The government must pay for the maintenance and the building of the dikes because the coastal inhabitants could not bear the costs alone. In former times this was likewise a common task of many people.



## Agriculturalist Argument

### CONTRA managed dike realignment:

The idea of opening the dikes and allowing the land areas behind to be flooded would undo the work of our ancestors. Dikes are a part of our cultural identity and should not be destroyed.



## Agriculturalist Argument

### PRO priority for humans:

The chance to live and develop economically behind the dikes must continue to be certain and safe also when sea levels rise. This is why dikes must be elevated. Only dikes offer security against storm floods. There are no alternatives.



## Agriculturalist Argument

### PRO priority for humans:

Today's Wadden Sea is a culture landscape, which has in the last 1000 years been developed by our ancestors. We must heighten the dikes when the water rises. Only that is important.



Agriculturalist  
Background



To heighten a kilometer of dike 10 cm it costs 200.000 - 400.000 Euro. These costs cannot be carried alone by the farmers living directly behind the dikes. The federal governments and the EU subsidise the maintenance of the dikes.

Agriculturalist  
Background



For more than a 1000 years the West-, East- and North Friesians have exerted a lot of energy claiming fertile land from the sea. The marshes, that can be seen everywhere along the North Sea coast, are a grandiose cultural achievement. To flood these areas would rob the Friesians of an important part of their identity.

Agriculturalist  
Background



Some 3,7 million people live in rural areas on the Wadden Sea coast behind the dikes. Innumerable domestic and wild animals would likewise be affected by storm floods. The safeguarding of people's lives and their personal property is a basic constitutional right.

Agriculturalist  
Background



Since the Holland flood of 1953 with over 1800 dead, the Netherlands has been able to build such a secure system of dikes and barrages that no new breaches of embankments or storm flood related deaths have occurred. This is proof of the high standard of dike building technology in the Netherlands.



## Nature Conservationist Argument

### PRO sand supplementation:

Sandbanks and tidal flat areas diminish with rising sea levels. Locations for resting and breeding birds, as well as sandbanks for seals are lost as a consequence. Sand supplementation on the beach or off coast could counteract this.



By the year 2100 it is estimated that sea levels will rise at least 50 cm. This would result in the loss of many tidal flats. Building dikes further reduces tidal and salt marsh areas, because 10 m high dikes have a base 100 m wide. Sand supplementation with material taken from the North Sea far offshore could replenish the missing sediment needed in the Wadden Sea.

Nature Conservationist  
Background



## Nature Conservationist Argument

### PRO managed dike realignment:

Rising sea levels demand flexible, well thought out strategies, especially for the low lying Netherlands. Flood polders that can be filled by extreme storm floods, serve both coastal protection and nature conservation.



In occasionally flooded polders salt marshes that have been lost in front of the dikes because of rising sea levels can reestablish themselves. In addition the neighbouring dikes are relieved, when water during a storm flood is allowed to flow under control into the polder.

Nature Conservationist  
Background



## Nature Conservationist Argument

### PRO holistic coastal protection:

Salt marshes grow higher the fastest, when they are not grazed and can develop naturally. The proportion of undisturbed areas should therefore be increased.



The biodiversity of plants and small animals in the salt marshes is decreasing because of sheep and cattle grazing. Some breeding birds avoid extremely short grazed salt marshes and during storms less mud is sedimented here. It would therefore serve coastal protection as well as nature conservation to have as many naturally developing salt marshes as possible.

Nature Conservationist  
Background



## Nature Conservationist Argument

### PRO holistic coastal protection:

The Wadden Sea is going to become increasingly narrow as sea levels rise. Millions of migrating birds will lose their feeding areas.



For the transient arctic birds the Wadden Sea is a vital stepping stone on their migration routes. Being responsible for their survival, we must maintain large flat areas that they can search for food — either before the dikes by raising the tidal flats or behind the dikes by transforming fields to tidal flats.

Nature Conservationist  
Background





## Tourism Manager Argument

### CONTRA managed dike realignment:

For the Dutch the coastal landscape has a high symbolic value. Because of this the opening of dikes would not be publically accepted.



## Tourism Manager Argument

### PRO/CONTRA priority for humans:

Vacationers want security but also nature. Therefore a good compromise has to be found between areas with protecting structures and stretches of natural coast.



## Tourism Manager Argument

### CONTRA dike strengthening:

A view of the sea is hardly possible with dikes that are 12 m high. Therefore other solutions have to be considered.



## Tourism Manager Argument

### CONTRA sand supplementation:

It is annoying for vacationers when throughout the whole summer on the beach construction projects are taking place. Also, extracted sand is often displeasingly coarse.



## Tourism Manager Background



All of the Dutch see themselves as coastal inhabitants even if they live far inland. Dikes, dunes and islands are given high idealistic value. Together they form a landscape, that is anchored in national awareness. Therefore it is inconceivable, that any of these areas should be abandoned and allowed to be flooded.

## Tourism Manager Background



Water sports and boating are greatly enjoyed by vacationers. Harbours must be strengthened to be secure even with rising sea levels. At the same time any construction in the water should not endanger the safety of surfers or bathers.

## Tourism Manager Background



In Holland often there are dikes 12 m high and in Germany up to 10 m.

## Tourism Manager Background



The sand for beach nourishment is either pumped through pipelines onto the beach and spread out with bulldozers or sprayed onto the coastline from ships. Both ways let the beaches look like construction sites which is incompatible with enjoyment of nature and peaceful recreation.





## Coastal Protectionist Argument

### PRO dike strengthening:

Coastal protection is a tradition that goes back hundreds of years and is a fantastic human achievement – one should speak of dikes as one of the wonders of the world.



In the 18th century, it took 10 weeks at 80 hours per week and 1000 people in action to construct a dike 3 km long. All of our dikes exist because of the work of countless ancestors. These dikes just cannot be left to be sacrificed to floodwaters.

Coastal Protectionist  
Background



## Coastal Protectionist Argument

### PRO sand supplementation:

Sand supplementation supports the other coastal protection measures (i.e. dikes, dunes). They complement these and increase their effectiveness.



Sand supplementations are cost intensive, because they have to be repeated every few years. However, they protect the beaches by decreasing the energy of the waves before they hit the beach. The stability of the dunes is increased and dikes, as well as, dunes do not have to be "repaired" as often.

Coastal Protectionist  
Background



## Coastal Protectionist Argument

### PRO priority for humans:

Without human intervention natural barriers such as salt marshes or dunes offer little protection against flooding and rising sea levels. The coast must be protected with coastal protection measures such as brushwood fences and groynes.



Many foreland areas would be eroded away without sediment trap fields. The energy of the waves has to be reduced before they reach the edge of the salt marsh. Furthermore the deposition of sediment on the salt marsh is accelerated with sediment trap fields. With a sea level rise rate of over 1 cm per year the salt marshes would "drown" or erode away without help.

Coastal Protectionist  
Background



## Coastal Protectionist Argument

### CONTRA holistic coastal protection:

It is impractical and unaffordable, to raise the tidal flats including the islands and the marsh behind the dikes. We have to concentrate on maintaining the inhabited areas.



If we wanted to raise the whole wadden sea area 13.000 km<sup>2</sup> with sand by 1 meter, it would cost about 50 milliard Euros. Dikes and stones are cheaper.

Coastal Protectionist  
Background





## Agriculturalist Argument

### PRO priority for humans:

Man has always had to oppose nature. In evolution everyone has to look out for himself, herself or itself. We cannot be considerate of every flower and every worm.



The animals and plants especially in the Wadden Sea area are adapted to constant change. They have already survived 1000 years of land reclamation, they will certainly be able to maintain themselves in the future.

Agriculturalist  
Background



## Agriculturalist Argument

### PRO holistic coastal protection:

When the salt marshes disappear, the wild geese could damage our fields and meadows behind the dikes. Therefore coastal protection authorities should see to it that there are enough salt marshes forelands.



Completely ungrazed forelands develop partly into thick fields of couch-grass, in which Brent- and barnacle geese do not apparently like to browse. For several years now, geese were repeatedly observed eating also winter grain and thereby causing crop damage. Many farmers in Schleswig-Holstein are of the opinion that by discontinuing grazing in the salt marshes, geese have been forced out of the forelands into cultivated fields.

Agriculturalist  
Background



## Agriculturalist Argument

### CONTRA managed dike realignment:

To open the dikes would be to capitulate to the destructive powers of nature. It would be much better to find new forms of utilizing the marshland in a future oriented way.



Opening dikes will cause the loss of many areas that otherwise would be available for the use of wind parks, solar parks and modern agricultural use such as the cultivation of corn for biomass production. Many people and animals would have to be moved out of these areas to new areas, which would cause the more intensive use of other regions.

Agriculturalist  
Background



## Agriculturalist Argument

### CONTRA sand supplementation:

If coastal protectionists were to start sand supplementing everywhere, it would reduce the value of the foreland salt marshes for grazing. On the sandy salt marsh the livestock find less valuable food.



When sand supplementation not only takes place on the beaches but also input into the salt marshes. The vegetation cover on sandier salt marshes is more diverse than on muddy sediment, but less dense and is of poorer quality for livestock.

Agriculturalist  
Background





## Nature Conservationist Argument

### PRO managed dike realignment:

We need once again areas in which the natural dynamics of the ocean can act. Some tidal flats will be lost because of rising sea levels. Uninhabited or sparsely inhabited coastal regions are appropriate for dike opening.



Through the controlled opening of dikes, areas can again develop that are regularly flooded and new sediment can be deposited. The ground level "rises" and can then keep pace with rising sea levels. New tidal flats are established to replace those lost. Old dikes that are the second line of defense behind the sea dikes can be repaired, improved and heightened in order to take over the role of coastal protection again.

Nature Conservationist  
Background



## Nature Conservationist Argument

### CONTRA sand supplementation:

Where sand for supplementation is taken all benthic organisms are destroyed. Larger animals lose their basic food resources. For marine benthic sediments sand extraction has the worst negative impact.



During sand extraction benthic animals are disturbed, removed with the sediment or suffocate after being covered with suspended sediment. The excavation of sand either leaves deep holes, where hostile mud aggregates, or sand is extracted from large areas where all life is destroyed for years.

Nature Conservationist  
Background



## Nature Conservationist Argument

### PRO holistic coastal protection:

The Wadden Sea is a National Park and has even been declared a World Heritage Site in Germany and the Netherlands. We are therefore obligated to preserve it with all its natural treasures – also against sea level rise caused by us.



Without dikes rising waters would simply advance inland and new natural tidal flats would develop. As long as we don't allow this to happen, it is our responsibility to see to it that on the existing tidal flats all natural values are maintained.

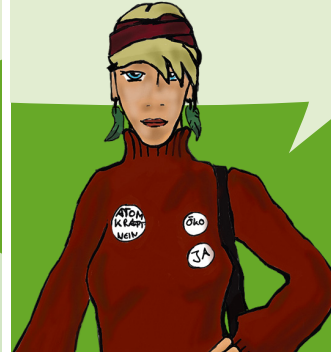
Nature Conservationist  
Background



## Nature Conservationist Argument

### PRO holistic coastal protection:

Salt marshes are valuable habitats. They are home to unique and specially adapted plants. They have to be preserved also if the sea levels rise.



Approximately 300 plant and insect species exist only in the salt marsh. Birds such as the oystercatcher, seagulls and redshank breed in the salt marsh, altogether nearly half a million birds. Other bird species use the area to rest or as an important food source (i.e. geese). Because of this the EU has placed all salt marsh areas under protection (Habitat-Directive).

Nature Conservationist  
Background





## Tourism Manager Argument

### PRO dike strengthening:

In summer because of climate change the weather is becoming harder and harder to predict. The high risk of storms can discourage some tourists from coming. Therefore it is very important that the highest possible protection be provided. This means the dikes have to be elevated.



The increased frequency of storms caused by climate and weather changes, will also affect the tourists attitude towards the North Sea. To date tourist development has not been negatively affected by bad weather, however storms and flooding would be such negative advertising that the number of guests might drop.

## Tourism Manager Background



## Tourism Manager Argument

### PRO sand supplementation:

Beaches are very important for the guests on the coastal mainland and the islands, because a wide variety of opportunities for relaxation, recreation and sport exists. Therefore sandy beaches must be protected and maintained. For both coastal protection as well as tourism, sand supplementation is of common interest.



The spectrum of sport activities and types practiced while on vacation is continually increasing. Many tourists on the North Sea coast like to wind surf, kite surf, sail or fly kites. Beaches are irreplaceable especially for families and young sport enthusiasts.

## Tourism Manager Background



## Tourism Manager Argument

### PRO holistic coastal protection:

Many tourists find it disturbing when concrete, asphalt and stone installations are placed in the landscape or cover the beaches.



Most tourists do not come back when the beach disappears under concrete, stone pilings and steel walls. Many visitors even want beaches that are so wide that they can drive their cars onto them (i.e. beach parking lots on the Wadden Sea island of Rømø).

## Tourism Manager Background



## Tourism Manager Argument

### PRO holistic coastal protection:

The tidal flats, dunes and salt marshes are particularly special in the Wadden Sea. When preserved, tourism and coastal inhabitants will have a future.



There are sandy beaches along many coasts of the world. However, a shallow sea whose bottom you can walk on at low tide is something special. It is essential to maintain this unique characteristic especially when considering touristic competition with the Baltic Sea and the Mediterranean areas.

## Tourism Manager Background

