Second opinion NuStar terminal expansion

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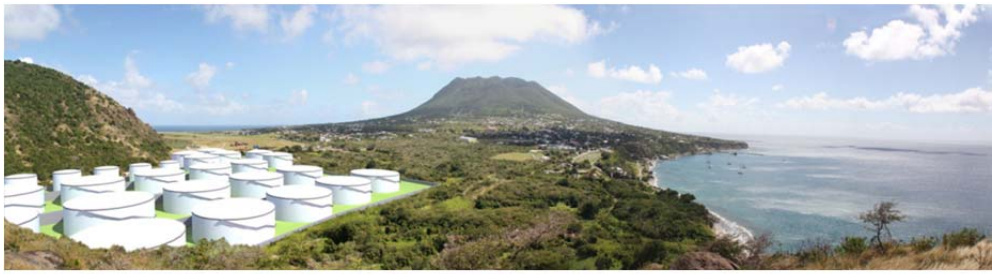

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Summary

In this report a second opinion is developed for the Environmental Impact Assessment NuStar terminal expansion. Only the marine ecology part of the EIA report is evaluated focusing on the impacts reported for marine reserves, reef- and sea-grass habitat, conchs, turtles, marine mammal and fish. The criteria used are: completeness, consistence, transparency, ecological soundness, and relevance of the foreseen impacts resulting from the terminal expansion.

When applying these criteria we have found that most of the impact assessments were incomplete (missing information and data, missing expected impacts). Reference base line data has been incompletely collected. Furthermore, many of the assessments were not transparent (based on the information given in the EIA we could not come to the same conclusion). Also we found that the reasoning to come to a conclusion in the EIA was not ecologically sound in many cases (e.g. mobile species are not affected by habitat loss because they can move out the area instead of describing an effect on the distribution area and thus on the abundance or density of the species). In a few cases assessments scored not relevant or were not assessed in a consistent way.

Furthermore, we found that not all expected (potential) impacts were assessed and that those assessed were mainly qualitatively assessed only. Data on pressures was incomplete as was data on ecological receptors, and some publically available data was not used. At the end of this report we list these data needs and missing impact assessments.

1. Introduction

Scope of the second opinion
In this report a second opinion is developed for the Environmental Impact Assessment NuStar terminal expansion, as described in the final report 23 September 2011 by Royal Haskoning. Only the marine ecology part of the EIA report is evaluated focusing on the impacts reported for marine reserves, reef- and sea-grass habitat, conchs, turtles, marine mammals and fish (see the tables 1, 2 and 3 of this report). The criteria used are: completeness, consistence, transparency, ecological soundness, and relevance of the foreseen impacts resulting from the terminal expansion.

The evaluation uses as a guideline the general framework on oil terminals evaluation as developed by the MER commission (MER, 2011). Besides location specific information as well as expert knowledge on possible effects on the habitat types and species mentioned, published literature is used.

The framework developed by the MER commission can be used to evaluate EIAs of oil terminals both on impacts in the terrestrial as in the aquatic system. This general framework is based on the EU Guidance on EIA (EIS review, 2001) which is applicable for the evaluation of EIA reports in Europe. For more information on the framework we refer to the MER report (MER, 2011).

This report on a second opinion starts with some general remarks in chapter 2 on some parts of the EIA that are crucial for a good description of the expected impacts on habitat types and species. These parts are:

1. Description of the proposed terminal expansion (chapter 2.1)
2. Description of the reference situation regarding the existing terminal and related activities (chapter 2.2) and the occurrence of the habitat types and species (chapter 2.3)

After the general remarks the expected impacts on the marine ecology objectives, habitat types and species are evaluated in chapter 3.

In chapter 4 conclusions are presented.

2. General remarks

Structure of the report
The EIA report is not logically structured which reduces its transparency. What is missing is a logic distinction and description of

1. the proposed terminal expansion in terms of pressures on the ecology of the area.
2. the reference situation as presented by the existing terminal and related activities in terms of pressures on the ecology of the area.
3. the occurrence of habitat types and species (in time represented by trends) and space.

The lack of logical structure is illustrated e.g. by the discussion of ecological impacts of pressures before these pressures are described. For instance the pressure noise is treated in chapter 12 whereas the impact of noise is treated in earlier chapters. In general it is better first to discuss all the pressures and then the ecological impacts.

2.1 Proposed terminal expansion

For a complete description of the expected impacts on the ecology of the area and specific habitat types and species an adequate and full description of the proposed terminal expansion is necessary (in terms of pressures). Information on pressures however, is sometimes scattered in the document. E.g. scarce and incomplete information on the estimated increase in shipping activity as a consequence of NuStar expansion is only mentioned at page 12 under the description of the Jetty (additional 450 ships) and on page 46 under marine sediment and water quality (a 45% increase in vessel traffic).

From the project description it is unclear that there are actually two options for the jetty: A and B. These options are first mentioned in paragraph 7.2 on page 40 and reference to Fig. 7.1 is made for option B on page 49. Option A is however not clearly stated in the text to be visible in Fig. 7.2. It would be helpful to give information on the positions of the jetty in the paragraph on project description.

2.2 Reference situation regarding the terminal and its activities

For the description and evaluation of the possible impacts a complete and as quantitative as possible description of the existing terminal and its activities is necessary. Regarding this topic some important information is missing that makes the impact description incomplete.

Baseline data of current vessel traffic for the Dutch Caribbean waters surrounding St. Eustatius visiting NuStar is missing. Vessel type and size, route, speeds, port of embarking etc. should be documented. The terminal expansion will result in an estimated increase in vessel traffic. No information on current and incomplete information on future vessel traffic is given. Data on current vessel traffic Increase in traffic has a direct impact on the marine ecology and should be introduced before assessment of the impacts of the terminal expansion.

Also information on axillary issues is missing such as current and foreseen pollution by shipping waste, nutrients and ballast water.

Ballast water is an issue under current operations as can be inferred from a report on incidence of ballast water ”On Feb. 26 2002 Statia was unpleasantly surprised by a big oil spill. The tanker Paulina, moored at the Statia Oil Terminal, had unwittingly been pumping out ballast water mixed with oil. Year 7 - No 1, February, 2002 Letitia Buth, Paul Hoetjes, Eric Newton, Mario Kleinmoedig. Dept. Environment & Nature (MINA) – Dir. Public Health, Santa Rosaweg 122, Curaçao, N.A.”

Also information on ship types is missing. According to White et. al. (2007) the NuStar oil terminal functioned as a transhipment point for single hulled tankers to transfer oil to doubled hulled ships. Only double hulled tankers are allowed in waters of nations that ratified the Marpol 73/78 convention.
Base line data of current anchoring sites and time of stay of oil tankers visiting NuStar is missing in the EIA.

Baseline data on the spill track record at NuStar, documenting frequency, magnitude, grade of spilled oil, causes for the spills, which (if any) dispersants were used, and baseline level of contaminants in relevant biota are missing in the EIA. Oil spills have occurred frequently and chronically at the NuStar facilities over that last two decades. These data are precisely recorded and available from NuStar, the Coastguard (enforcer), The Curacao Ports Authority (oil spill coordinator Netherlands Antilles), and at Directie Scheepvaart Curacao). Nowhere are these data presented or analysed to give an accurate base-line of frequency, magnitude or nature of the spills.

The remarks in 2.1 and 2.2 are confirmed by and in accordance with the general framework on oil terminals evaluation (MER, 2011). Based on this guideline the project description should pay special attention to the following issues:

- Are any existing activities which will alter or cease as a consequence of the Project identified?
- Are any other existing or planned developments with which the project could have cumulative effects identified?

Besides more in detail the MER commission stated that:

- general information on shipping should be provided including ship movements of ships passing St Eustatius, ships visiting St Eustatius, mooring sites etc. Moreover, insight should be provided on the percentage of ships visiting the current NuStar operation and the expected increase given the NuStar expansion.
- general information for emissions should be provided in the MER such as the amount and composition of products handled by NuStar and the quantities of toxic compounds (e.g. Hg, benzene etc.) accepted by NuStar in these products when delivered to NuStar.
- information should be provided on the risk of oil spills and contingency plans in case oils spills occurs.

2.3 Ecology of the area and occurrence of habitat types and species

To estimate and evaluate the expected impacts on the habitat types and species a complete description of these types and species is necessary; their abundance in space and time (as quantitative as possible) preferably summarized in maps. Also the vulnerability and resilience of ecological objects to pressures caused by the NuStar expansion must be described but is incomplete (e.g. the sensitivity of reefs and sea grass for turbidity and sedimentation).

The description of the distribution of marine flora and fauna is also incomplete and maps are missing. Available information has not been used. For example data and maps for see-grass and reefs are available but missing. For those ecological objectives where data and maps are not available such as in case of densities of turtles in the various habitat types around St. Eustatius, basic mapping should be developed (following the simple study design used for Bonaire by the STCB) to document densities and identify key areas of turtle concentration or turtle hot spots.

The marine ecological survey performed for the EIA is restricted to an area of about 2 square km in front of the planned storage tanks expansion site. This area does not include the site where jetty option B is planned. No adequate control sites were used. Sampling was not based on design criteria, neither were

sample size or sample replication. No statistically meaningful parameter estimation was done and no statistically meaningful comparisons were made. Consequently, the ecological survey does not provide quantifiable base line data on the current ecological status that can suffice as a reference for future impacts of the planned expansion of NuStar. Actually only the incidence of species is recorded based on a single sampling activity in 2011. More quantifiable data can easily be collected using video transects in an appropriate sampling design collected at the current operational site, the planned sites and an undisturbed reference site. The simple “BACI” approach (Before, After, Control, Impact) which is standard methodology in environmental impact assessment (Smith 2002) has been disregarded. Furthermore, because of the risk of possible catastrophes causing damage on habitat types e.g. coral reefs the description of relevant environmental conditions is incomplete. Available information on water currents and incidence of tropical storms and hurricanes has not been used and is not reported (see e.g. Slijkerman et al, 2011).

3. Impact assessment

Figure 1 Foreseen location for Terminal expansion (EIA NuStar Expansion)

In the paragraphs 3.1, 3.2 and 3.3 a second opinion is given on the EIA report especially on the parts concerning marine reserve and benthic community, sea turtles and marine mammals and fish. In the second opinion we followed each combination of receptor and impact description as given by the EIA report in table 19.1 (page 152).

In each paragraph we first present in a table a summary of the impacts as described in the EIA report (tables 1, 2 and 3). For each combination of receptor and impact description we present the conclusions, using the wording of the EIA report, followed by our second opinion.

3.1 Evaluation of the impact assessment on the marine reserve and benthic community.

In the EIA report the expected impacts on the marine park, coral and sea-grass habitat and conch is summarised in table 1.

Table 1 Summarizes the assessed impacts on marine reserve, reef, sea-grass and conch as described in the EIA (EIA, 2011 page 152-153).

Parameter	Receptor	Sensitivity (S)	Impact description	Project phase	Magnitude of impact (M)	Significance of impact (MxS)	Mitigation measure	Residual impact
Marine ecology	Marine reserve	High	Habitat loss N Marine Reserve Option B	C	Medium	Moderate /Major	Alter location jetty to avoid reserve	Minor
	Reef, sea grass, conch	Medium	Potential seabed habitat loss	C	Medium	Moderate	Efficient design of jetty foundations to reduce footprint, avoid sea grass	Minor
		High	Damage of habitats due to sedimentation and turbidity	C and O	Negligible	Minor/Moderate	High potential sensitivity of the reefs of the N Marine reserves	Minor
		Medium	Increase in number of anchor scars due to increase in number of vessels anchoring	O	Medium	Moderate	Installation of moorings	Beneficial
		Medium	Likely colonization of jetty	O	Beneficial	Beneficial	None	Beneficial

C-construction, O-operation.

3.1.1 Marine reserve

Habitat loss of Marine Reserve for Jetty option B:

The EIA report states that the receptor marine reserve is moderately to majorly impacted by the construction of the jetty in case of jetty option B. It is furthermore stated in the EIA report that jetty option B overlaps by a length of 150 m with the Northern Marine Reserve. No dredging is foreseen during the construction of the jetty. According to the EIA report the consequential significance of impact on the reserve mainly results from habitat loss during the construction phase at the position of the jetty. As mitigation an alternation of the jetty construction is suggested such that there is no spatial overlap of the construction with the reserve.

- Second opinion:

In our opinion this assessment is **not complete**.

First an ecological survey is missing for option B, and therefore the impact of this option on the reserve cannot be evaluated.

Secondly, we expect a negative impact of the jetty on the reserve during operation as well as during construction. It is expected that during operation large tankers will berth at the jetty and may stay there for some days during fuel reloading. During their stay these tankers will have an impact on the reserve resulting from e.g. pollution due to antifouling emission, ballast water emissions and spilled components (oil spills, and bilge water), light reduction at the sea bottom, and seabed disturbance (including re-suspension of polluted sediment) resulting from ship manoeuvring to reach the jetty. Moreover, an increase in vessel mooring near the Reserve will additionally increase the impact on the Reserve during operations. The actual impacts cannot be established due to the lack of information on:

- total number of vessels in different size classes,
- duration of stay at the jetty and time spend moored in or near the Reserve,
- frequency and quantity of oil spills under current operations.

Thirdly, St Eustatius is in a hurricane prone area, and increased runoff of fine sediment from the new storage tank site by water and wind erosion can be expected. In the EIA the risk of runoff is assumed to be restricted by site drainage and a rainwater collection pond. It is questionable if these measures will effectively reduce the runoff during bad weather conditions like hurricanes and tropical storms. Coral reefs are very sensitive to sedimentation. Grigg and Dollar (1990) stated in a review: “The impact of increased sedimentation is probably the most common and serious anthropogenic influence on coral reefs”. Therefore an increase in turbidity and sediment load as a consequence of fine sediment runoff from the construction site may be a serious risk to the reserve.

3.1.2 Reef, sea-grass and conch

Potential seabed habitat loss:

The EIA states that the receptor reef and sea-grass is expected to be impacted moderate as a consequence of habitat (sea bed) loss during the construction phase. As a mitigation an efficient design of the jetty is proposed such that the sea grass beds are avoided, which reduces the residual impact to minor.

- Second opinion

In our opinion this assessment is **not complete.**

As stated before an ecological base line survey is missing for option B, and therefore the impact of this option on sea-grass and coral reef cannot be evaluated.

The discussion on sea-bed loss resulting from the foundations of the jetty in the EIA report actually only focusses on jetty option A, whereas no survey data is available for option B. The EIA report states that the survey revealed an area of sea-grass that overlaps with the to-be-constructed jetty. The EIA report furthermore states that given the lack of knowledge on sea-grass distribution around St. Eustatius little can be inferred on the impact of the jetty construction on sea-grass. Information on the spatial distribution and amount of sea-grass in the coastal zone of St. Eustatius, however, is available (e.g. see STENAPA annual report 2007 and Slijkerman et al. 2011). This information is not used in the EIA report. The potential impact of habitat loss of corals reef is **not** discussed in the EIA.

As is the case for the impact of the NuStar expansion on the marine reserve, the impact during NuStar operation is also **not** discussed for reefs or sea-grass. In terms of effective loss of reef and sea-grass habitats in the immediate vicinity of the jetty, during the operational phase, as a consequence of tankers berthing at the jetty, we expect a much larger impact than currently acknowledged in the assessment by the EIA report.
The actual scale of these impacts cannot be established and quantified as no information is given in the EIA report on the different stress factors (total number of vessels in different size classes, duration of stay at the jetty etc.).

Damage of habitats due to sedimentation and turbidity:
The EIA report states that damage on the receptors “reef” and “seagrass” from the expected increase in turbidity and sedimentation is expected to be minor to moderate in the construction and operation phase. As a mitigation measure table 1 (see above) states ‘High potential sensitivity of the reefs of the N Marine reserves’.

- Second opinion

In our opinion this assessment is **not complete, not relevant and not transparent.**

As stated in the EIA report no dredging is required during construction, which is argued to minimize any impact on benthic ecology resulting from smothering and increased turbidity. Furthermore, the EIA report states that some increased turbidity may result from piling at the jetty and runoff from the storage tank construction site, but that due to the coarse nature of the sediment such runoff will settle quickly. No data is given on how the nature (grain size) of the sediment was determined. The only available information on grain size distribution in the EIA is on marine sediment, which in this case is not relevant. On page 42 of the EIA report the size class distribution of marine sediments is reported of which a large proportion has a large size (> 2mm). Information on the size distribution of soils at the reserve tank construction site is missing in the EIA report. To evaluate the potential impact of runoff from the storage tank construction site, this information should be provided, based on appropriate methods. Slijkerman et al. (2011) estimated the influence range of sediment and turbidity to range 1-2 km for fine colloidal sediment released in the harbour area of St. Eustatius, which happens to be relatively enclosed such that wind and waves have a relatively small influence on dispersal. Fine sediment released at the tank construction site therefore may move much further out of the area, influencing both the coastal zone in front of the construction site and the wider marine reserve. These risks can only be assessed with the data as indicated, which are missing in the EIA. Turbidity and sedimentation are distinct issues and are very important stress factors for reefs and sea grass since these ecosystems need light and light attenuation as a consequence of turbidity and sedimentation is one of the most important factors threatening reefs globally (Grigg and Dollar, 1990). As stated in Slijkerman et al. (2011) the reefs in St. Eustatius are in a good condition in general terms, but the reefs in Marine Park are already stressed by significant sedimentation due to erosion of cliffs and hillsides. A ‘plume’ is often visible around the island after heavy rainstorms. Sedimentation levels on reefs between 1 and 10 mg per cm^2 per day are considered safe (background levels), whereas chronic sedimentation rates above

10 mg per cm^2 per day are considered “high” (Rogers, 1990). Furthermore, as stated above, St. Eustatius is a hurricane prone country and bad weather conditions may result in large runoff from the storage tank construction site which may result in additional smothering of benthic habitats and increased turbidity. See for more information on sedimentation and turbidity at St Eustatius Slijkerman et al (2011).

There are different methods to measure sedimentation and turbidity. One is to measure the Suspended Particulate Matter (SMP) concentration which represents an instantaneous measure of the concentration of particles suspended in the water column, whereas sediment trap data measure the total downward flux of suspended particles. SPM is a better descriptor of long-term sediment effects on coral reefs. For coral reefs the following concentrations have been described as low, medium and high concentration.

	Low		**Medium**		**High**	
SPM ($mg.l^{-1}$)	0	2.5	1.5	6.0	4.0	7.0
Sediment in traps ($mgcm^{-2}d^{-1}$)	1	10			200	800

(from Meesters et al. 1998 in Slijkerman et al. 2011).

As a mitigation measure table 1 states ‘High potential sensitivity of the reefs of the N Marine reserves’. It is unclear what is meant by this statement and how this mitigation reduces the significance of the impact from moderate to minor into a minor residual impact.

Anchor scars:
The EIA states that damage on the receptor benthic communities resulting from an increase in anchoring of vessels (anchor scars) increases and assumed this increase to have a moderate significance of impact. As a mitigation the construction of moorings is advised which according to the EIA report will result in a beneficial residual impact.

- Second opinion

In our opinion this conclusion is ecologically sound, but **not complete**.

We state that the establishment of moorings by itself is positive. However, the proposed capacity expansion of NuStar will result in an increase in vessel presence and movement in the area. Therefore, the overall negative impact of this increase may be much larger than the positive impact of a reduction in anchor scars as a consequence of moorings. To fully evaluate the impact of moorings in a setting of an increased pressure of shipping activities in the area more insight is needed in the actual pressures of vessel presence in the area.

Colonization of jetty:
The EIA states that the construction of the new jetty is expected to provide hard substrate, and thus settlement habitat for benthic organisms, which is listed as a potential beneficial.

In our opinion this assessment **is not complete, and not ecologically sound**.

First we state that introduced hard substrate for settlement of benthic organisms is only beneficial to the ecosystem if there is a shortage of this substrate. Secondly non-indigenous species tend to settle on artificial substrates such as piers (e.g. Dumont, 2011). Vessels from all over the world will moor at NuStar and via the hull or ballast water non-indigenous species will enter the coastal zone of St. Eustatius. The jetty can therefore function as a foothold for these species which might become invasive. Recent research by Piola and Johnston (2008) underpins that establishment of marine invasive species is

often aided by disturbance and pollution (Piola and Johnston 2008) and that busy harbours are likely the areas where most non-indigenous species establish their first footholds. This will turn the suggested benefit actually into a potential strong negative impact. Since no baseline information on non-indigenous species in the coastal zone of St Eustatius is available, this issue cannot be quantified. More information, therefore, is needed on the origin of the vessels to evaluate the potential risk for non-indigenous species and their potential to be invasive. This can be done by using guidelines made available by IMO and GloBallast. Also information on the species composition on the existing jetty is most critically helpful to gain a better understanding on the actual risk of introduction of invasive species.

Impacts on conchs

In the EIA report the impact of the NuStar expansion on conch species is considered not relevant. It is stated that conchs as mobile species can move out of the area if the habitat turns unfavourable and that possible mortality will be low compared to harvesting mortality (citizens are allowed to harvest a maximum of 20 conchs per person per year). Further possible impacts on conchs are not considered by the EIA report.

- Second opinion

In our opinion this assessment is **not ecologically sound, and not complete**.

Considering the first argument that "mobile species can move out of an area if habitat turns unfavourable and the conclusion that any impact is not relevant" is not ecologically sound. If habitat becomes unfavourable for conchs resulting from NuStar activities actually habitat for conchs is lost and their distribution area is decreased as is their abundance.
Without additional data, the effect of NuStar activities on conch mortality cannot be compared to other sources of morality, and therefore the impact on conchs cannot be appropriately assessed.

3.1.3 Missing pressures

Pollution:

The impact of pollution (oil, oil components, dispersants and antifouling) on corals and conchs is **not** considered in the EIA report.

Conchs live in sandy habitat and sea grass. Given its habitat choice, longevity and feeding habits, conch accumulate pollutants. Michel and Averty (1999) reported that even for a TBT concentration in seawater of less than 1 ng L^{-1}, the females of some gastropods (conch belong to this group) may develop male sexual characteristics (imposex). At concentrations exceeding 1 ng L^{-1}, diatom growth and zooplankton reproduction are restricted; above 2 ng L^{-1}, oyster shells show calcification anomalies, and above 20 ng L^{-1}, reproductive anomalies are observed in bivalves. Marine sediments tend to be sinks for pollutants with a low water solvability (like TBT). Disturbance of these sediments can result in risk of bio-pollution. Movement of large vessels, like oil tankers can therefore strongly increase the availability of these pollutants by re-suspension of seabed sediment. The TBT levels in sediment reported in the EIA (see Appendix B EIA report; ranging up to 0.9-2.3) are above maximal tolerable limits of the Dutch Water Act (0.7µg/kg dry dm). This implies that levels in conch already may be high and may influence conch population performance. Information on pollutants in biota like conch are however missing in the EIA report such that the stated negative effects cannot be excluded. Simple data needs to be collected according to an adequate sampling design and with adequate replication to guarantee minimum test power.

Even after immediate toxic effects, research in the Dutch Caribbean has shown that chronic oil pollution can have important effects on coral communities (Eakin et al. 1994) and long-term effects on the

molluscan faunas of rocky-shores (80% decrease in mollusc densities and 36% decrease in mollusc species richness), many years after the spill has taken place (Nagelkerken and Debrot 1995). Such insight for St. Eustatius can be obtained by simple collection and comparison of data from affected and unaffected sites which are otherwise similar habitats. A recent review paper by Haakyla et al (2007) stresses the serious negative effects of oil on coral reefs.

Contaminants from oil spills ultimately concentrates in bottom sediments and benthic organisms (Botello et al. 1991) such as filter feeders (corals and sponges) and detritivores (molluscs and conch). Peters et al. (1981) show how oil bio-accumulates and causes histopathology in corals. Aside from contamination by petroleum hydrocarbons (PAHs), oil is also considered an important source for contamination of sediments and fauna with heavy metals (Guzman and Jimenez 1992).

Oil dispersants are used to combat oil pollution at the St. Eustatius facilities (e.g. during the 2002 Statia spill). Dispersants are highly toxic to marine fauna and facilitate the uptake of oil by marine organisms (Shafir et al. 2007). According to those authors, decision-making authorities should carefully consider these results when evaluating possible use of oil dispersants as a mitigation tool against oil pollution near coral reef areas. Recent research identified several dispersants that are less damaging to the environment (Thorhaug et al. 2005).

Underwater noise:
No information is provided in the EIA report on the impact of noise during Jetty construction on coral larvae. Coral larvae respond strongly to under water sound (Simpson et al. 2004; Simpson et al. 2005; Vermeij et al. 2010). Coral larvae use sound to find their way to the bottom where they settle (Vermeij et al. 2010). Coral larvae respond to acoustic cues that may facilitate the detection of habitat from large distances and from up current or preferred settlement locations (Vermeij et al. 2010). In brief, sound plays a critical role in the ecology of reef organisms. Disruption of the native sound spectrum in an area for a relatively long period such as indicated for this project, may have an impact on the ecological processes in that area.

3.1.4 Missing data and impact assessments

Missing data

- Maps on sea-grass and coral reef habitat around St. Eustatius
- Ecological survey for area jetty option B
- Data on oil spill track record at NuStar, documenting frequency, magnitude, grade of spilled oil, causes for the spills, and which (if any) dispersants were used
- Data on vessel traffic (number, size, type, origin, duration of stay at jetty, place and duration of stay mooring)
- Data on hurricane incidence and magnitude
- Data on size distribution sediments from oil terminal construction site
- Data on non-indigenous species on existing jetty, in ballast water and ship hulls
- Data on pollutant levels in conch
- Data on under water noise during jetty construction.

Missing impact assessments

- The impact vessels mooring in or near the marine reserve during operation is not discussed.
- The impact on the marine reserves as a consequence of increased runoff from the tank construction site is not discussed.
- The impact of habitat loss of sea- grass and coral reef during operation are not discussed
- The impact of habitat loss on coral reef is not discussed

- The impact of underwater noise on coral larvae is not discussed
- The impact of pollution on corals and conch is not discussed

3.1.5 Conclusion

In conclusion, we have to state that given incomplete and absent information on sea-grass, coral reef and conch abundance and spatial distribution (maps) and no quantitative information on the pressures (maps and quantification on vessel use of the area, oil spills etc. see detailed information given above) impacts cannot be appropriately quantified.
The EIA report fails to use available information. For instance, both in the impact assessments for sea-grass and coral reef only the data of the survey (see Appendix B EIA) was considered. More information is available but not used. E.g. information on the spatial distribution and amount of sea-grass in the coastal zone of St. Eustatius, however, is available (e.g. see STENAPA annual report 2007 and Slijkerman et al. 2011).

3.2 Evaluation of the impact assessment on sea turtles and marine mammals.

In the EIA report the expected impacts on sea turtles and marine mammals is summarised in table 2.

Table 2 Summarizes the impacts on green, leatherback and hawksbill turtle and marine mammals (EIA, 2011 page 152-153).

Parameter	Receptor	Sensitivity (S)	Impact description	Project phase	Magnitude of impact (M)	Significance of impact (MxS)	Mitigation measure	Residual impact
Marine Ecology	Green turtle	High	Disturbance breeding site (light, noise)	C and O	None	Negligible	None	Negligible
			Collisions	C and O	Low	Moderate	Shipping lanes	Minor
			Decline in sea grass habitat	C	Negligible	Minor	Protection sea grass elsewhere	Negligible
	Leather-back turtle	High	Disturbance breeding site (light, noise)	C and O	None	Negligible	None	Negligible
			Collisions	C and O	Low	Minor/Moderate	Shipping lanes	Minor
	Hawksbill turtle	High	Disturbance breeding site (light, noise)	C and O	Medium	Moderate	No construction in breeding season, avoid appearance of lights at sea	Minor
			Collisions	C and O	Low	Moderate	Shipping lanes	Minor
			Decline in habitat	C	Low	Moderate	Protection elsewhere	Minor
	Marine mammals	Medium	Impact resulting from underwater noise	C	Medium	Moderate	Use marine mammal observers Postpone start up Soft start/ramp up of pilling	Minor /moderate
			Collisions	C and O	Medium	Moderate	Develop agreed shipping lanes	Minor /moderate
			Reduction in available prey	C and O	Low/ Negligible	Minor	None	Minor
			Pollution with oil spills	O	Low	Minor/ Moderate	Develop oil contingency plans	Minor

C-construction, O-operation.

3.2.1 Sea turtles

Light and noise disturbance at breeding site:
EIA report states that the green and leatherback turtle have no nesting sites near the construction location, whereas the hawksbill turtle has a nesting site 700m from the construction site. The EIA report therefore concludes negligible impact on green and leatherback turtle and a moderate impact on the hawksbill turtle. As a mitigation for this impact no construction in the breeding season is suggested and avoidance of the appearance of light at sea (other than navigation lights).

- Second opinion

In our opinion this assessment is **not transparent**

We agree with the assessment on green and leatherback turtle. For the hawksbill turtle however it is not clear to us how the mitigation "avoidance of the appearance of light at sea (other than navigation lights)" reduced the moderate significance of impact into a minor.

Vessel strikes:
EIA report states that near the jetty vessel speed is low (4km/h) and state that at this speed collisions with vessels are rare, referring to Hazel et al (2007). The EIA report furthermore states that densities of leatherback are low (not recorded in water survey by Smith (2008)), no information was given for green turtle. The EIA report assumes that Hawksbill turtles reach relative high numbers in the area near the jetty during the breeding season referring to Smith (2008) who reported Hawksbill to be associated with the Northern Reserve. The EIA report states that vessel strikes have a moderate significance of impact on green and hawksbill turtles and a minor to moderate impact on leatherbacks. Mitigation by shipping is suggested to reduce these impacts to minor residual impacts.

- Second opinion

In our opinion this assessment is **not complete, transparent and not ecologically sound**.

First we state that actually the EIA report only links the vessel strike issue to the small area near the jetty, the area where vessel speed is low. It does not assess the impact of vessel strikes farther from the jetty. Secondly the assessment is made without information on vessel numbers and speed nor densities and distribution of foraging sea turtles in the various important sea-turtle habitats around St. Eustatius. This makes the assessment incomplete and not transparent.

Maritime traffic has an important deleterious impact on sea turtles, which may even be larger than other important sources of anthropogenic mortality such as unimproved trawling (Hazel and Gyuris 2006). The most vulnerable species are the loggerhead and green turtle (Hazel and Gyurnis 2006). The reason for this is that while these animals generally feed below surface or on the bottom, they spend significant time (up to 12%) floating on the surface for breathing and sunning (Hochscheid et al. 2010). This makes them more susceptible than previously realized to vessel strikes. Vessel strikes are directly related to number of vessels and vessel speed, both of which have shown increasing trends in recent years. The number of vessels currently visiting NuStar amounts to roughly 1000 vessels per year (interpreted from the EIA report that states and increase of 45% increase in vessel traffic (Pag. 46) means an additional 450 ships (pag. 12)), among which both large tankers and smaller fuel carrying vessels. This data is very precisely known (by NuStar and port services) but is nowhere presented or analysed in the EIA report. The report states roughly that the number of vessels will increase by 450 (less than half) whereas the capacity of NuStar with the expansion will more than double. This certainly raises question marks. No reliable indication is given on past, present or the expected operational trend of increase in vessel traffic in coming years. The risk and actual (but undocumented) impact of vessel strikes can only be expected

to increase with the number and speed of vessels. Nowhere is this information provided in the EIA report, which renders this assessment incomplete.

Without information on the densities and distribution of sea turtles in the area as well as information on the use of this area by vessels and their speed no inference can be made whether shipping lanes can mitigate vessel strikes. One can even expect shipping lanes to increase vessel strikes if they suffice as a barrier (e.g. dividing breeding site and foraging site of sea turtles as can be expected for the leatherback turtle that breeds south of the NuStar terminal and feeds in the Northern Reserve), based on the provided information the suggested mitigation is therefore not ecologically sound

Habitat loss:
The EIA report states for the green turtle that habitat loss has minor significance of impact based on small loss of sea-grass habitat due to construction of jetty A (the EIA report refers to paragraph 8.3.2), and a suggested low impact of artificial lighting, noise and increased human activity on the access of turtles to their feeding grounds. The impact of habitat loss on the hawksbill is considered moderate by the EIA report especially for jetty option B. As mitigation measure protection of sea-grass and reef habitat elsewhere is suggested to reduce the moderate impact to a minor residual impact.

- Second opinion

In our opinion this assessment is **not complete, not transparent, not relevant, and not ecologically sound**.

Habitat loss for sea turtles is not quantified in the EIA report. The EIA report appears to imply that habitat loss is limited to the area directly occupied by the pilings. Each piling is indicated at a diameter of 1.2 m for the jetty pilings and 1.5-2 m for the dolphin pilings. As the number of pilings is nowhere given, it is impossible to estimate how much bottom area will be directly occupied by the pilings.
We state that habitat loss will be much greater than only the area occupied by the pilings. The key habitats for sea turtles are sea-grass (green turtle) and coral reefs (hawksbill). These ecosystems are driven by sunlight. Without sunlight the primary producers will disappear and effective feeding habitat for two sea turtle species will be lost. Therefore, shading by the new pier and the vessels moored will be the most important effect responsible for productive habitat loss. This aspect is not mentioned and quantified in the EIA report. The width of the pier and height are key determining factors for effective area shaded by the pier. These data are not given in the report and no analysis on habitat loss is provided. Also the additional surface area which will be effectively shaded by anchored vessels is not quantified.

STENAPA has developed a habitat map for sea-grass and reefs around St. Eustatius (STENAPA, 2007, 2010). This information can be combined with satellite imagery to develop a habitat map for St. Eustatius providing total surface area per habitat type (see Slijkerman et al. 2011). Based on this habitat map and the area affected by shading it is simple to estimate the total habitat loss in terms of the percentage of sea-grass and (possibly) coral reef. As a consequence the EIA report gives no quantitative insight into the habitat loss involved in the planned NuStar expansion. Also areas seemingly “barren” may still constitute productive sea-grass habitat for sea turtles or other important species like conch. Sea-grasses grow based on rhizomes under the sediment. Just like other higher plants sea-grass display strong seasonal growth and shedding of leaves, also in the tropics. An area seemingly barren today may be covered with a thick sea-grass bed in another season of the year. The EIA report does not explain this effect nor explain what this can imply for their habitat assessment.

The mitigation measures suggested in Table 2 protection of habitat elsewhere does not seem relevant since the EIA report refrains from actually quantifying the habitat loss.

3.2.2 Marine mammals

Underwater noise:

The EIA assessed the impact on cetaceans during the construction phase will be moderately adverse. The EIA states that noise from pilings potentially mask dolphin noise and cause disruption of natural activities. As mitigation measures the EIA report suggest to use acoustic devices to determine the presence of any marine mammals during piling start up, to postpone start up until marine mammals within close distance have moved away, and soft start/ramp up of pilling activities to give marine mammals the opportunity to move away without harm. These mitigations are suggested to reduce the impact to minor/moderate.

- Second opinion

In our opinion this assessment is **not complete, not transparent not ecologically sound.**

First we state that provided information on the intensity of the noise level is not provided by the EIA report. The EIA report describes that the duration of hydraulic hammering is 7-8 months for the jetty pilings. The EIA does not provide information on how many jetty pilings are concerned. Furthermore no information is provided on the actual expected sound levels and frequency spectrum at given distances from the jetty, nor information on the distribution of marine mammals. Without this information the assessment is not complete and transparent.
Secondly the EIA report fails to consult the most recent literature on the topic of underwater noise and to include information on mammal presence. As a consequence, the assessment is not ecologically sound. Recent research has shown marine mammals to be very sensitive to underwater sound. The potential direct impacts include physical damage to auditory or non-auditory tissues, perceptual, such as interfering or altering intraspecific communication, behavioural, such as short or long-term displacement from an area, and chronic, such as increased vulnerability to disease. Potential indirect impacts include reduced availability of prey and or increased vulnerability to numerous hazards (Parsons and Dolman 2004).

Tougaard et al (2009) show that the area of sound effects from pile driving to harbour porpoise is more than 20 km in the relatively shallow North Sea. Brandt et al (2011) reach similar conclusions and also saw how noise from pile driving led to a long-term decrease for the totality of the pile driving construction period. In an area surrounded by deep waters such as St. Eustatius, the distances where noise may impact cetaceans can be expected to be even farther from the source. This may be almost out to the Saba Bank, an area likely to be an important nursery area for the endangered humpback whale (Debrot et al., in press). The long-term disturbance by sound could have lasting effects on the presence of cetaceans in a large area around St. Eustatius as migratory habits are affected and resident dolphin populations are displaced.

The mitigation measures suggested do not include the measure bubble-curtains. Bubble curtains currently is suggested to offers the best promise to reduce underwater noise produced by pilings (Wursig et al. 2000, Dolman 2004; MacGillivray and Racca 2006; Jefferson et al 2009). The mitigation measures suggested by the EIA report indicate to reduce impact only on marine mammals near to the construction site (e.g. use acoustic devices to determine the presence of any marine mammals during piling start up, to postpone start up until marine mammals within close distance have moved away).

Vessel strikes:

The EIA report states that of those marine mammals that are present in waters around St Eustatius most occur in deep waters. The bottlenose dolphin, spinner dolphin and humpback whale, however, were recorded close to the coastline. Based on this information the EIA report assumes that the impact of

vessel strikes on marine mammals will have moderate significance of impact. As a mitigation measure shipping lanes are suggested to reduce this impact to a minor residual.

- Second opinion

In our opinion this assessment is **not complete, and not ecologically sound**.

First we state that seemingly the impact of vessel strikes on marine mammals is only considered close to the coastline. Secondly, given the absence of information on marine mammal presence (maps) and shipping activity to and from the NuStar operation (vessel density and distribution, vessel size and speed) no quantitative inference can be made on the risk of vessel strikes. Without this information the assessment on vessel strikes is incomplete, not transparent and not ecologically sound. The long-term effects of the NuStar expansion will be increased vessel traffic near St. Eustatius and the EEZ. Such traffic in open waters where cetaceans occur typically takes place at high velocity such with an increase in vessel traffic and increase in vessel strikes can be anticipated. In areas with heavy vessel traffic vessel strikes are recognized as a key impact for large cetaceans (Panganida et al. 2011). Vessel strikes have been documented for the Dutch Caribbean (Debrot et al. 2011) and their impact on marine mammals is likely much more than currently realized.

<u>Reduced availability of prey:</u>

The EIA states that the construction activities of the NuStar expansion can potentially displace prey resources, which is expected to be a localised effects, and marine mammals in this area should be able to follow the prey. The EIA concludes on this statement that the significance of impact is minor.

- Second opinion

In our opinion this assessment is **not complete, not transparent, not consistent and not ecologically sound**.

We conclude that based on the provided information the conclusion that reduced availability of prey has a minor impact is not transparent. First we state that the actual pressure is not stated in the EIA report. We presume that the EIA report refers to noise: on page 66 the EIA report states ”Construction activities have the potential to replace prey resources (i.e. fish, see section 11)” and in section 11 noise is considered the only impact of moderate significance. Without information on spatial distribution of marine mammals, nor that of their prey, nor information on the pressure noise on prey, this impact cannot be appropriately assessed.

<u>Pollution with oil spills:</u>

The EIA report assessed the impact of oil spills on marine mammals as minor to moderate. This conclusion was based on the assumptions made in the EIA report which were: citation “Due to the short term timescale and the infrequent and local extent of the impact of oil spills on marine mammals”. Mitigation of this impact is suggested by appropriate contingency planning and remediation measures to be reduced to a minor residual impact.

- Second opinion

In our opinion this assessment is **not complete, not transparent, not consistent and not ecologically sound**

We conclude that based on the provided information this assessment cannot be made. The data on oil spills given by the EIA report is incomplete. The EIA report only mentions three spills (1992, 2002 and 2004) but documentation was also easily found via Google for spills in 2005 and 2009. These spills are occasionally large eg. March 15, 1992: 100 barrels #6 fuel oil fouling the leeward coast east to White

Wall, and February 26 2002, when oil had to be “mopped up” from large parts of the shoreline, and may even affect the sea turtle nesting beaches on the other side of the island (2004), or may cover large parts of the ocean (28 May 2009: Valombrosa caused a slick of about 4 km x 500 m wide). Dispersants are used in some cases (eg. 2002) even though the effect on marine life can be very serious. Without a complete overview of the oil spills at St Eustatius a conclusion that oil spills are citation for the EIA report “short term timescale and the infrequent and local extent” cannot be made.

Furthermore, the argumentation given in the EIA report is not consistent, in the same paragraph as where the EIA states “Due to the short term timescale and the infrequent and local extent of the impact of oil spills on marine mammals”. Two lines earlier they state “There is no information available on the environmental impacts of these reported incidence (referring to the three spills of 1992, 2002 and 2004)”.

As stated above oil contamination in St. Eustatius is frequent, but not quantified. Without this information and an estimation on the increase of oil spills given the expansion of NuStar activities, little can be inferred on the impact of oil spills and contamination with oil components such as PAH and heavy metals on marine mammals. Marine mammals in general, given their longevity, role in the food chain, and high fat content tend to accumulate lipophilic pollutants such as PAHs (Fair et al. 2010).

3.2.3 Missing pressures

Oil pollution:

The impact on oil spills on turtles is not evaluated in the EIA report

Recent research has proven serious negative impacts by oil spills on sea turtles. This can take the form of burns to the skin of the animals when they surface to breathe (e.g. NMFS U.S. 1993) or contamination of eggs (Vasquez et al. 1997) through contamination of nesting beaches. Sea turtles may even mistakenly see floating Tar as food items and feed on these (Atwood et al. 1987). Oil spills in the Caribbean can affect a large number and wide range of animals (Mignucci-Giannoni 1999). Rescue costs can be high and a large proportion of treated animals typically succumbs despite efforts (Mignucci-Giannoni 1999). Oil spills have occurred frequently and chronically at the NuStar facilities over that last two decades. These data are precisely recorded and available from NuStar, the Coastguard (enforcer), The Curacao Ports Authority (oil spill coordinator Netherlands Antilles), and at Directie Scheepvaart (Curacao). Nowhere are these data presented or analysed in the EIA to give an accurate base-line of frequency, magnitude or nature of the spills.

3.2.4 Missing data and impact assessments

Missing data

- Maps of turtles densities in the various habitats around St. Eustatius to document densities and identify areas of turtle concentration
- Maps of cetacean distribution in St. Eustatius near shore waters using the study design applied to the waters of St. Maarten (by the St. Maarten Nature Foundation in their 2011 study). Maps of current and projected vessel traffic and speeds for the Dutch Caribbean waters surrounding St. Eustatius
- Data on oil spill track record at NuStar, documenting frequency, magnitude, grade of spilled oil, causes for the spills, and which (if any) dispersants were used
- Data on vessel traffic (number, size, speed)
- Maps on sound levels due to jetty pilings
- Data on the number of pilings and size (width and height) of the jetty
- Baseline level of contaminants in nesting beach sediments and turtle eggs

Missing impact assessments

- Impact of vessel strikes on turtles farther from the direct neighbourhood of the jetty (vessel speed >4km/h) is not discussed
- The impact of oil spills and pollution on turtles is not discussed.

3.2.5 Conclusion

In conclusion, we state that the EIA report lacks proper and recent information on spatial use of the marine area by mammals and turtles and gives no quantitative information on the pressures (maps and quantification on vessel use of the area, oil spills etc. see detailed information given above) that can cause an impact. Part of this information can be made easily available, e.g. information on vessel traffic and oil spills. The last being precisely recorded and available from NuStar, the Coastguard (enforcer), The Curacao Ports Authority (oil spill coordinator Netherlands Antilles), and at Directie Scheepvaart (Curacao).

3.3 Evaluation of fisheries and noise

In the EIA report the expected impacts on fisheries and noise is summarised in table 3.

Table 3. Summarizes the impacts on fish (EIA, 2011 page 152-153).

Parameter	Receptor	Sensitivity (S)	Impact description	Project phase	Magnitude of impact (M)	Significance of impact (MxS)	Mitigation measure	Residual impact
Fisheries	Fish	Low	Disturbance of fish due to pilling noise	C	Low	Minor	None	Minor
			Increased vessel activity	O	Negligible	Negligible	None	Negligible
			Oil spills	O	Negligible	Negligible	None	Negligible
			Jetty as artificial reef	O	Beneficial	Beneficial	None	Beneficial
Noise	Fish	High	Pilling	C	Low	Moderate	Bubble screen	Minor/ Moderate

C-construction, O-operation.

3.3.1 Fish

<u>Noise and increased vessel traffic:</u>
The EIA report states that the impact of noise on fish is considered minor given the ability of fish to move away, and the fact that the immediate area of construction was not noted for significant fish assemblages. The same arguments (ability to move and area not noted for significant fish assemblages) are given in the EIA to qualify the impact of increased vessel traffic during operation as negligible.

- Second opinion

In our opinion this assessment is **not complete, and not ecologically sound**.

We state that fish is sensitive to noise. Noise of pile driving can have a negative effect on both adult fish and fish larvae. Lethal effects are expected if the pressure waves released with pile driving result in implosion of the air in the swim bladder of fish. Sub lethal effects involve loss of habitat resulting from

avoidance response, and reduced sensitivity to sound which impacts survival (avoiding predator) and reproduction (finding mate). Fish larvae respond to sound (Simpson et al. 2004). Noise generated by a reef community provides a valuable orientation cue for reef fish; both for larvae as they recruit to reefs, and for adults and juveniles during nocturnal movements (Kennedy et al. 2010). Compared to adult fish, fish larvae are generally assumed more sensitive because they cannot actively move out of the area.

Based on the available information provided by the EIA report it is difficult to estimate the impact of piling noise on fish. Data is lacking on how many jetty pilings are concerned. Data on the actual underwater noise levels expected to be caused by the pilings is also absent. This makes it difficult to estimate the strength (noise levels at certain distances) and the intensity (noise waves per time) of this pressure. The known and most effective method to reduce collateral damage from pile driving (bubble curtains) is not mentioned or proposed.

Both the loss of fish habitat (caused by avoidance of the area) and death of fish (larvae and adults resulting from underwater noise) have an impact on population dynamics of fish and a consequential impact on its predators (e.g. marine mammals).

Oil spills:
The EIA states the impacts of oil spills on fish to be negligible given the fact that fish can move away from the impacted area.

- Second opinion

In our opinion this assessment is **not complete**, and **not ecologically sound**.

We have stated earlier in this document for other ecological receptors that without insight in the actual pressure of oil spills it is difficult to estimate the possible impact of oil spills on species. Oil spills can have short term direct effects on organisms by e.g. skin burns and clogging breathing systems (such as gills of fish). These short term direct effects can be avoided by moving out of the area, but only if fish are able to sense oil components and respond appropriately. On the longer term oil components and detergents will be taken up in the food chain, causing high internal pollutant concentrations in fish and possibly effects on reproduction and survival, thus effecting the population dynamics.

Jetty as artificial reef:
The EIA states that the jetty might serve as artificial reef for fish and thus being beneficial for fish since it can attract fish.

- Second opinion

In our opinion this is a minor issue (**not relevant** issue) and the assessment is **not complete, and not consistent**.

Indeed, we agree with the conclusion that structures like jetties tend to attract fish. However, the surrounding area was noted not significant for fish assemblages (EIA report stated on page 95) and therefore the EIA report considered the impact of noise and vessel traffic on fish negligible. In our opinion it is inconsistent to assume that the jetty has a beneficial effect on fish if the direct surroundings have been noted not significant for fish assemblages. Moreover, if the jetty indeed has a beneficial effect on fish this will change the assessment on noise and increased vessel traffic from negligible to moderate.

3.3.2 Noise:

Pilling

The EIA states that there is no reliable method for quantitatively predicting the underwater noise levels resulting from marine piling. In the assessment of the impact of noise reference is made to Dr. P Henderson (referred to as Proof of Evidence of Dr. A.P. Henderson for London Gateway Port HEO, May 2003) who noted that underwater noise within 5m of pile driving can cause injury or mortality in fish and at 2 km avoidance reactions.

- Second opinion

In our opinion this assessment is **not complete**.

Contrary to the claim made in the EIA, methods are available to quantify underwater noise levels resulting from piling. Based on measurements made in the field at standardised distances from the jetty information on noise spectra, pressure levels, propagation etc. can be assessed and a noise map can be compiled via interpolation.

The suggested mitigation of pilling noise with bubble screens is a good suggestion. Bubble screens are currently the most promoted mitigation methods. By using a bubble screen or bell curtain around the site where piles are driven, reductions of the total broadband noise levels by 3 to 5 dB is allegedly feasible (Würsig et al. 2000). Some studies have shown significant noise reducing effects of bubble screens (up to 25 dB reduction), but it remains to be demonstrated that such high levels of attenuation can be achieved repeatedly in deeper waters under influence from currents and winds.
Another mitigation option is to apply vibration instead of hammering. Hammering causes sound levels under water orders of magnitude higher than compared to vibration.

3.3.3 Missing pressures

No missing pressures

3.3.4 Missing data and impact assessments

Missing data

- Data on oil spill track record at NuStar, documenting frequency, magnitude, grade of spilled oil, causes for the spills, and which (if any) dispersants were used
- Data on vessel traffic
- Maps on sound levels due to jetty pilings
- Data on the number of pilings
- Maps on fish abundance and distribution
- Baseline level of contaminants in fish

Missing impact assessments

No missing impact assessments

3.3.5 Conclusions

For the impact assessments on fish we state that the EIA report did not attempt to make an assessment on the impact of fish given that fish was assumed to be able to move out of the area and the area was not considered important for fish (page 95 citation " the immediate area of construction is not noted for significant fish assemblages"). A proper assessment should include information on the abundance and distribution of fish and give quantitative information on the pressures (maps and quantification on noise levels, oil spills etc.) these data are not available in the report.

4. Conclusions

Apart from the conclusions regarding the impact assessments (chapter 3) we make the following general remarks:

- All expected impacts are only qualitatively assessed and quantitate information on pressures and the ecological objectives is generally missing. This makes an appropriate evaluation of the expected effects on the habitat types and species not possible.
- Essential and readily available quantitative data has generally not been used.
- Related to the mentioned absence of quantitative information the report does appropriately not describe the impacts at different scales of time and space. So short term effects and long lasting effects are hardly discerned, and likewise small and large spatial scale effects are hardly discerned.
- Similarly the EIA report does not discern effects on different levels of organisation (e.g. individual, population and ecosystem).
- The remarks above imply that it is not possible to compare the effects and to rank them in importance.
- Finely we found that in the EIA report cumulative effects are not described.

By applying the criteria mentioned in the Introduction we have found that most of the impact assessments were incomplete (missing (but available) information and a lack of existing data, potential impacts that were not considered). Furthermore, many of the assessments were unsatisfactory transparent (based on the information given in the EIA we could not come to the same conclusions). Also we found that the reasoning to come to a conclusion in the EIA was not ecologically sound in many cases (e.g. mobile species are not affected by habitat loss because they can move out the area instead of describing an effect on the distribution area and thus on the abundance or density of the species). In a few cases assessments were scored not relevant or not consistent (i.e. contradicting conclusions on the same information).

4.1 Second opinion

4.1.1 Marine reserve, reef, sea-grass and conch

For the impact assessments on marine reserve, reef, sea-grass and conch we state that given incomplete and absent information on sea-grass, coral reef and conch abundance and spatial distribution (maps) and no quantitative information is provided on the pressures (maps and quantification on vessel use of the area, oil spills etc. see detailed information given above) impacts cannot be quantified.
The EIA report fails to use relevant available information. For instance, both in the impact assessments for sea-grass and coral reef only the data of the survey (see Appendix B EIA) was considered. More information is available but not used. E.g. additional information on the spatial distribution and amount of sea-grass in the coastal zone of St. Eustatius is available (e.g. see STENAPA annual report 2007 and Slijkerman et al. 2011).

4.1.2 Sea turtles and marine mammals

For the impact assessments on sea turtles and marine mammals we state that the EIA report lacks proper and recent information on spatial use of the marine area by mammals and turtles and gives no quantitative information on the relevant pressures (maps and quantification on vessel use of the area, oil spills etc.) that can cause an impact. Part of this information can be made easily available, e.g. information on vessel traffic and oil spills. The last being precisely recorded and available from NuStar,

the Coastguard (enforcer), The Curacao Ports Authority (oil spill coordinator Netherlands Antilles), and at Directie Scheepvaart (Curacao).

4.1.3 Fish

For the impact assessments on fish we state that the EIA report did not fully attempt to make an assessment on the impact of fish given that fish was assumed to be able to mitigate out of the area or the area was not considered of importance for fish (page 95 citation " the immediate area of construction is not noted for significant fish assemblages"). A proper assessment should include information on the abundance and distribution of fish and provide quantitative information on the pressures (maps and quantification on noise levels, oil spills etc.) these data have not been presented in the report.

4.2 Missing data and impact assessments

Missing data

- Maps on sea-grass and coral reef habitat around St. Eustatius
- Ecological survey for area jetty option B
- Data on oil spill track record at NuStar, documenting frequency, magnitude, grade of spilled oil, causes for the spills, and which (if any) dispersants were used
- Data on vessel traffic (number, size, type, origin, duration of stay at jetty, place and duration of stay mooring)
- Data on hurricane incidence and magnitude
- Data on the size distribution of sediments from oil terminal construction site
- Data on non-indigenous species on existing jetty, in ballast water and on ship hulls
- Data on pollutant levels in conch
- Maps of turtle densities in the various habitats around St. Eustatius to document densities and identify areas of turtle concentration
- Maps of cetacean distribution in St. Eustatius near shore waters using the study design applied to the waters of St. Maarten (by the St. Maarten Nature Foundation in their 2011 study).
- Maps of current and projected vessel traffic and speeds for the Dutch Caribbean waters surrounding St. Eustatius
- Maps on sound levels due to jetty pilings
- Data on the number of pilings and size (width and height) of the jetty
- Baseline data on contaminant levels in nesting beach sediments and turtle eggs
- Maps of fish abundance and distribution
- Baseline data on contaminant levels in fish

Missing impact assessments

- The impact of vessels mooring near the marine reserve on the reserve during operation is not discussed.
- The impact of increased runoff from the tank construction site on the marine reserves is not discussed.
- The impact of habitat loss of sea-grass and coral reef during operation are not discussed
- The impact of habitat loss on coral reef is not discussed
- The impact of underwater noise on coral larvae is not discussed
- The impact of pollution on corals and conch is not discussed
- Impact of vessel strikes on turtles farther from the direct neighbourhood of the jetty (vessel speed >4km/h) is not discussed
- The impact of oil spills and pollution on turtles is not discussed.

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Quality Assurance

IMARES utilises an ISO 9001:2008 certified quality management system (certificate number: 57846-2009-AQ-NLD-RvA). This certificate is valid until 15 December 2012. The organisation has been certified since 27 February 2001. The certification was issued by DNV Certification B.V. Furthermore, the chemical laboratory of the Environmental Division has NEN-AND-ISO/IEC 17025:2005 accreditation for test laboratories with number L097. This accreditation is valid until 27 March 2013 and was first issued on 27 March 1997. Accreditation was granted by the Council for Accreditation.

Justification

Report C148/11
Project Number: 4305201901

The scientific quality of this report has been peer reviewed by a colleague scientist and the head of the department of IMARES.

Approved: Dr. R.G. Jak
Research Scientist

Signature:

Date: 15 November 2011

Approved: J.H.M. Schobben, MSc.
Head of Department

Signature:

Date: 16 November 2011