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CEDA Central Dredging Association
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WORKSHOP SULLA VALUTAZIONE DEGLI EFFETTI FISICI DOVUTI ALLA MOVIMENTAZIONE DEI SEDIMENTI IN AREE MARINO-COSTIERE: STRUMENTI E METODOLOGIE DI APPROCCIO
WORKSHOP SUR L'ÉVALUATION DES EFFETS PHYSIQUES CONSÉQUENTS À LA MANIPULATION DES SÉDIMENTS DANS LES ZONES MARINES CÔTIÈRES: INSTRUMENTS ET MÉTHODES D'APPROCHE
WORKSHOP ON THE ASSESSMENT OF PHYSICAL EFFECTS RELATED TO SEDIMENT HANDLING IN MARINE AND COASTAL AREAS: TOOLS AND SHARED APPROACHES

Evaluating Environmental Turbidity Limits for Dredging Operations

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Background

In 2016, the CEDA Environment Commission (CEC) conducted a survey to investigate which environmental turbidity limits existed on dredging projects, how these limits were set, and how the environmental limits impacted the projects (financial and time-wise).

- Interestingly. the survey showed that compliance monitoring on average contributed about 1% – 5% to the cost of the dredging project.

- The majority of the respondents indicated that they understood and supported the need for environmental turbidity limits.

- A major part of the limits did not seem to be scientifically founded. Limits varied regionally, and per project, but did not always seem to be linked to local sensitive receptors.

CEDA Working Group on Guidelines for assessing and evaluating environmental turbidity limits for dredging operations

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What is a turbidity limit?

- It is a limit beyond which impacts from spills from dredging operations are not allowed to go.
- Usually it is a limit meant to protect environment or to protect recreational or structural values.

Can be defined in the following way:

- As a absolute value including the background
- As an excess value over the background
- As part of a spill budget defining the amount of spill the area can take.

Why is it interesting to set the limit right?

- If it is set too high the environment will be impacted to much and habitats may be lost.
- If the limit is set to low the dredging operation will suffer excessive costs to monitoring and mitigation measures.
- A random or historic litterature value may tricker either of the two.

What is turbidity?

"The reduction of transparency of a liquid caused by the presence of un-dissolved matter" (ISO, 2014)."

But often used much more broadly as:

• NTU	Optical
• FTU	Optical
• SSC	Concentration
• TSS	Concentration
• PPT	Concentration
• ….	

Very important to distinguish between optical parameters and concentration based parameters.

Conversion from light dampening to concentration

Conversion depend on:

- Grainsize disribution
- Color of sediment
- Shape of sediment

Conversion is usually based on simultaneous measurements together forming a claibration relation.

However this only works under static conditions. If grainsizes change so should the calibration factors. One lightdampening or light scattering can correspond to any number of concentrations depending on the grainsize.

Typical environmental impacts

Direct effects:

- Reduced marine growth of algae, corals and seagrass due to light dampening
- Coverage of filterfeeders etc
- Reduced recreational or commercial value of water areas, beaches etc due to elevated concentrations.

Indirect effects

- Reduced populations of fish due to changed habitats
- Reduced populations of birds due to changed habitats
- Reduced popultaions of mammals due to changed habitats
- Reduced earnings for humans due to changed habitats

Conceptual system understanding

To set a reasonable environmental one should understand local dynamics for:

- Currents
- Waves
- Sediment transport and concentration levels
- Biology
- Antropogenic factors

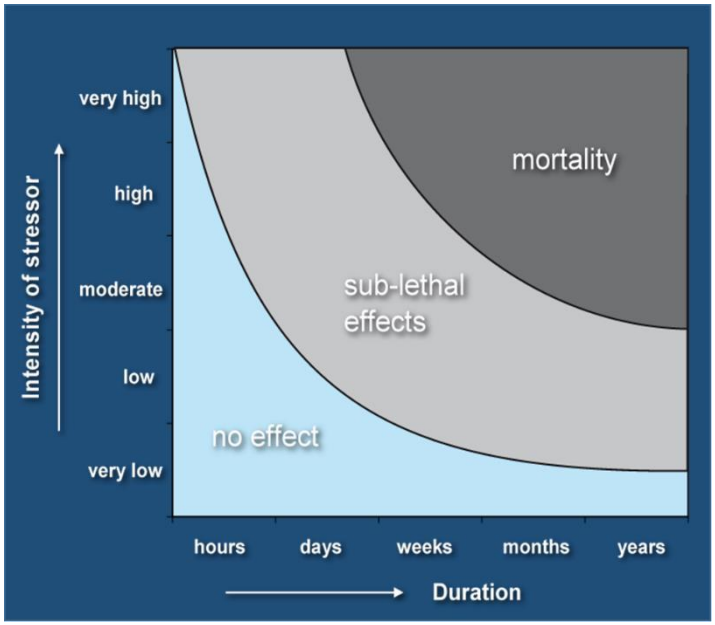
Baseline conditions and dynamics should be established.

Identify sensitive receptors and determine stress levels

To set a reasonable environmental limit one should identify local sensitive receptors. Typically:

- Seagrass
- Algae
- Corals
- Filterfeeders
- Antropogenic factors

Identify how sensitive these are to a temporary change in concentration levels.
Identify seasonal variations.

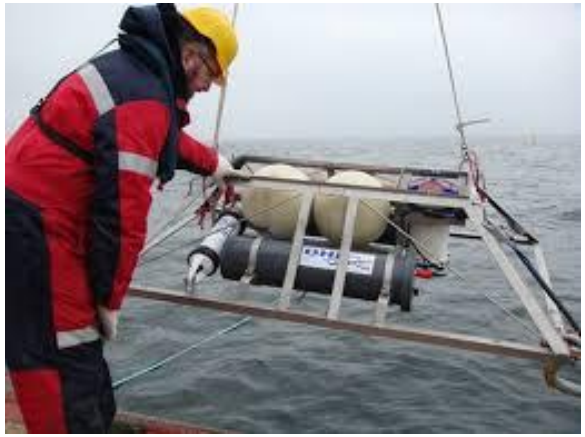


Intensity - Duration - Frequency (McArthur et al., 2002)

Technical understanding. What can be monitored

Evaluate the system and evaluate the measuring technologies available. What can be measured and where?

For instance: In some environments it may not be possible to do OBS measurements due to excessive concentrations or rapidly shifting grainsizes.



From: Dhigroup.com

Project understanding

To set a reasonable environmental one should understand how the dredging project operates:

- Type of equipment
- Spill profiles
- Mitigation measures
- Dredging plans

From Dredgingtoday.com

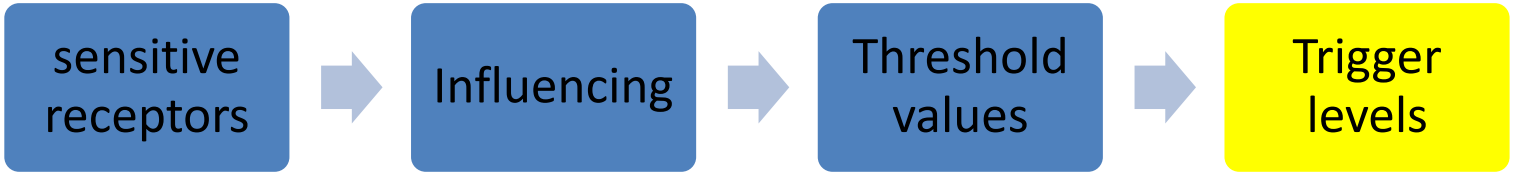
Project compliance

To set a reasonable environmental one should understand how the dredging project operate in order to comply with limits. Usually a monitoring program is set up along with three concentration levels:

- Warning level: indicating a measurable influence on the stress level, allowing to investigate the causes and identify possible solutions
- Action level: indicating that levels continue to rise and that mitigation measures need to be taken to prevent impact level to be reached
- Impact level: indicating that the increased stress levels have the potential to harm the sensitive receptors and action needs to be taken to urgently reduce the stressor levels below impact level.

Setting trigger levels

As part of the sensitive receptor analysis identify stress (influencing) factors and the maximum allowable stress level. Set trigger levels accordingly.



Must be done for all sensitive receptors. Triger levels can vary in both time and space.

Monitoring trigger levels

- Where? Clear definition on monitoring points
- When? May only be relevant in some seasons and during some periods of project
- What? Determine which parameters used for monitoring and whether it is absolute meaures or excess measures.

Approach

We propose the following steps which can originate from a dedicated study, an EIA or from a local survey done in connection with the project. All the following is applicable in time and space.

- Develop a system understanding
- Describe the expected dredging operation in terms of spill
- Identify receptors sensitive to dredge plumes
- Determine critical stress levels for sensitive receptors.
- Determine influence areas
- Choose a measurable turbidity limit based on the critical stress levels for receptors.
- Determine where and when the turbidity limit applies based on the influence areas, the sensitive receptors and the dredging plan.

Conclusion

Environmental turbidity limits for dredging operations should always be site-specific, and based on ecosystem functioning, in order to protect sensitive environmental receptors. By setting realistic limits, monitoring can be made more cost-effective and ecologically, and socially, relevant.

Thank you for listening

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