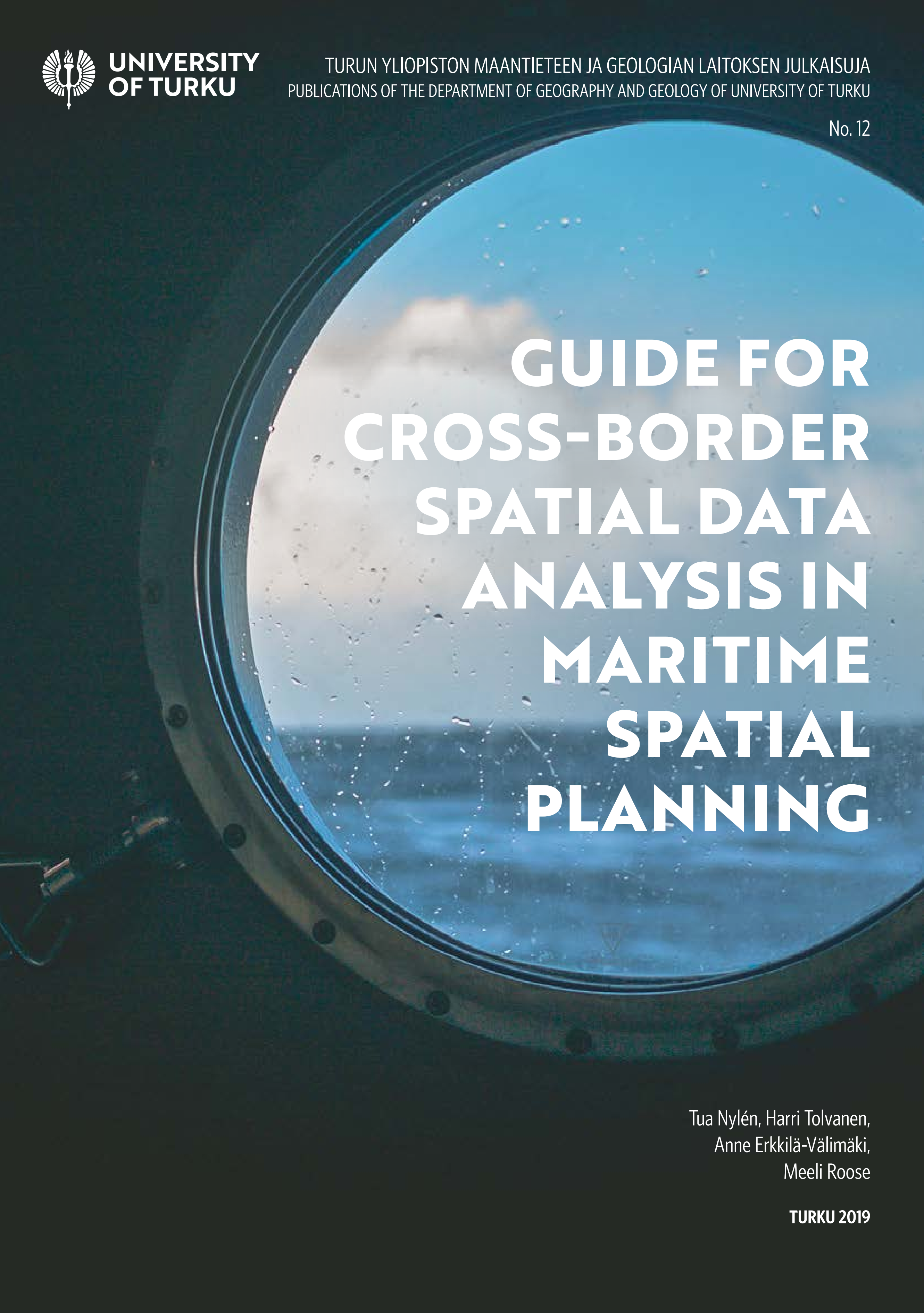

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GUIDE FOR CROSS-BORDER SPATIAL DATA ANALYSIS IN MARITIME SPATIAL PLANNING

Tua Nylén, Harri Tolvanen,
Anne Erkkilä-Välimäki,
Meeli Roose

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GUIDE FOR CROSS-BORDER SPATIAL DATA ANALYSIS IN MARITIME SPATIAL PLANNING

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KÄSIKIRJA RAJAT YLITTÄVÄN MERIALUESUUNNITTELUN PAIKKATIETOTYÖSKENTELYYN

MEREALA RUUMILISE PLANEERIMISE PIIRIÜLESE RUUMIANDMETE ANALÜÜSI KÄSIRAAMAT

Tua Nylén, Harri Tolvanen, Anne Erkkilä-Välimäki, Meeli Roose

FOR THE READER

This guide is targeted at regional planners and spatial data officers involved in national and cross-border Maritime Spatial Planning. It aims at helping the regional planner understand and evaluate maps and other outputs of spatial data analysis. In addition, it seeks to assist the GIS specialist in understanding Maritime Spatial Planning and designing spatial data analysis workflows in a goal-oriented way.

The content of the guide arises from literature and experiences from an MSP pilot project. It was prepared as part of the project Plan4Blue (Maritime Spatial Planning for Sustainable Blue Economies, 2016-2019, http://www.syke.fi/projects/plan4blue), co-funded by the EU European Regional Development Fund (Interreg) and project partner organisations*. The project was carried out in the Gulf of Finland in northern Europe, involving Finland and Estonia (territorial waters and exclusive economic zones of Finland and Estonia). To engage global readership, particularly among GIS specialists who participate in planning processes, the text is published in English. In addition, the most general content, which is seen as useful to all planners, is also presented in Finnish and Estonian, to better involve the audience in the project countries.

*Project partners: Finnish Environment Institute SYKE, University of Tartu, University of Turku, Helsinki-Uusimaa Regional Council, Regional Council of Southwest Finland, Baltic Environmental Forum Estonia.

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LUKIJALLE

Tämä käsikirja on tarkoitettu erityisesti kansalliseen ja kansainväliseen merialuesuunnitteluun (MSP – Maritime Spatial Planning) osallistuville aluesuunnittelijoille ja paikkatietoasiantuntijoille. Käsikirjan tavoite on avata aluesuunnittelijoille spatiaalisten analyysien mahdollisuuksia ja rajoitteita sekä antaa suunnittelijoille valmiuksia arvioida paikkatietoanalyysien tuloksia ja niiden visualisointia. Lisäksi tämä kirja antaa paikkatietoasiantuntijalle käytännön vinkkejä merialuesuunnitteluun liittyvien työprosessien päämäärätietoiseen kehittämiseen.

Käsikirja perustuu kirjallisuuteen ja kokemuksiin kansainvälisestä merialuesuunnittelun Plan4Blue-pilottiprojektista (Maritime Spatial Planning for Sustainable Blue Economies, 2016–2019, http://www.syke.fi/projects/plan4blue), jonka rahoittavat yhdessä EU:n aluekehitysrahasto (Interreg) ja hankepartnerit*. Hankealueeseen kuuluu Suomenlahti Suomen ja Viron alueella (Suomen ja Viron aluevedet ja talousvyöhykkeet). Kirja on englanninkielinen, koska kohdeyleisö on kansainvälinen, ja paikkatieto-ohjelmistot sekä alan kirjallisuus ovat pääsääntöisesti englanninkielisiä. Yleisen tason sisältö esitetään myös suomeksi ja viroksi, jotta Plan4Blue-hankkeeseen osallistuvat sidosryhmät tulisivat paremmin huomioiduiksi.

*Hankepartnerit: Suomen ympäristökeskus SYKE, Tarton yliopisto, Turun yliopisto, Uudenmaan liitto, Varsinais-Suomen liitto, Baltic Environmental Forum Estonia.

LUGEJALE

Käesolev käsiraamat on suunatud siseriikliku ja rahvusvahelise mereala ruumilise planeerimisega (MSP – Maritime Spatial Planning) seotud ametnikele ja geoinfosüsteemi spetsialistidele. Käesoleva käsiraamatu eesmärk on avada planeerijale ruumianalüüsi võimalusi ja piiranguid ning aidata hinnata ruumianalüüsi tulemusi ja nende visualiseerimist. Lisaks annab see raamat geoinfosüsteemi spetsialistidele praktilisi nõuandeid mereala ruumilise planeerimise tööprotsesside sihipäraseks arendamiseks.

Käsiraamat põhineb kirjandusel ja kogemustel, mis on saadud rahvusvahelise mereala planeerimise katseprojektist Plan4Blue (2016-2019; http://www.syke.fi/projects/plan4blue), mida kaasrahastavad ELi regionaalarengu fondi (Interreg) ja projektipartnerid*. Projekti piirkond hõlmab Soome lahte Soome ja Eesti territooriumil (Soome ja Eesti territoriaalveed ja majandusvööndid). Raamat on inglise keeles, sest sihtrühm on rahvusvaheline ning ruumiline tarkvara ja kirjandus on peamiselt inglise keeles. Üldise taseme sisu esitatakse ka soome ja eesti keeles, nii et Plan4Blue projekti kaasatud osapooled oleksid paremini arvesse võetud.

*Projektipartnerid: Soome Keskkonnainstituut SYKE, Tartu Ülikool, Turu Ülikool, Helsinki-Uusimaa omavalitsus, Edela-Soome omavalitsus, Balti Keskkonnafoorum Eesti.

CONTENTS

SPATIAL INFORMATION IN MARITIME SPATIAL PLANNING

Spatial information is one of the cornerstones of Maritime Spatial Planning (MSP). It is present in the pre-planning stage, in the mapping of the baseline status of the planning area, in analysing the interactions between activities and in evaluating and communicating planning options. Successful evaluation, collection, management, analysis and visualisation of spatial information are the key for making evidence-based planning decisions.

In the European Union, MSP is a national or regional process depending on the member country. Cross-boundary issues in spatial information influence MSP processes at all scales since countries, counties and sectors must consider their neighbours. Economic activities are often dependent on international and multisector interactions. Habitats, species and environmental issues do not respect administrative borders and may be influenced by human activities on the other side of the border. Therefore, the different practices in the management of spatial information across geographical and thematic boundaries must be dealt with.

Compared to land use planning, spatial data utilisation in MSP faces many additional challenges. Ownership and jurisdiction are different at sea than on land, and there is more variation in these practices across administrative borders. The differences must be explicitly accounted for in the planning process, and they influence spatial data sources, availability and quality. There are no static boundaries at sea and the vertical dimension must be considered more specifically than on land. Thus, multifunctionality and seasonal uses have potential at sea, but are challenging to analyse. Moreover, there are less data available (e.g. Vetter et al. 2012) and specific data types may be particularly difficult to obtain regarding the sea. Generally, there are no official records of the influence areas of economic activities or the recreational use of the sea space. Land-sea interaction is vital for the environmental status and economic development of the sea, but may be difficult to transform into explicit spatial information.

This guide seeks to improve the efficiency and transparency of spatial analysis in MSP processes. We highlight the importance of five principles:

- **Guiding spatial data analysis in a goal-oriented (instead of data-oriented) way**
- **Collaborating with all MSP actors throughout the process, to fulfil the first principle**
- **Using the best available spatial data and excluding inadequate data from the analyses**
- **Documenting the utilised spatial data and analysis methods and their limitations at every step of the MSP process**
- **Sharing and utilising high quality spatial data across administrative and sectoral borders**

Following these principles in MSP ensures that the potential of spatial information and spatial analysis is utilised in decision-making. Moreover, it guarantees that decisions are based on appropriate information and that the end-users are able to evaluate it themselves.

PAIKKATIETO MERIALUESUUNNITTELUSSA

Paikkatieto on merialuesuunnittelun (Maritime Spatial Planning, MSP) keskeinen perusta. Paikkatietoa käytetään esivalmisteluissa, vallitsevan tilanteen kartoittamisessa, suunniteltujen toimintojen ja ympäristön keskinäisten vuorovaikutusten arvioinnissa sekä tulosten visualisoinnissa ja arvioinnissa prosessin eri vaiheissa. Paikkatiedon arviointi, kokoaminen, esikäsittely, analysointi ja visualisointi ovat olennaisia tietoperusteisen päätöksenteon työvaiheita.

Euroopan Unionin jäsenmaat soveltavat merialuesuunnitteludirektiiviä joko kansallisena tai alueellisena prosessina. Rajat ylittävä (cross-border) paikkatietojen tarve ja käsittely ovat kuitenkin aina läsnä, sillä eri mittakaavoissa rajoja – hallinnollisia aluerajoja tai taloudellisten ja yhteiskunnallisten sektorien välisiä rajoja – joudutaan aina ylittämään. Taloudelliset toiminnot ovat usein riippuvaisia kansainvälisestä ja monialaisesta toimintaympäristöstä. Elinympäristöt, eliölajit ja ympäristön tilaan liittyvät kysymykset eivät seuraa hallinnollisia rajoja, vaan niihin vaikuttavat naapurialueilla tapahtuvat prosessit. Siksi on tärkeää, että merialuesuunnittelussa rajat ylittävien aineistojen analyysit tehdään huolellisesti ja työhön liittyvät haasteet tiedostetaan.

Merialueiden paikkatietotyöskentelyssä kohdataan useita lisähaasteita maa-alueiden vastaavaan verrattuna. Merialueiden omistusolot ja niiden hallintaan liittyvä lainsäädäntö poikkeavat maa-alueista, ja näissä käytännöissä on usein suurempaa vaihtelua hallintorajojen eri puolilla. Nämä seikat on otettava huomioon merialueiden suunnittelussa, ja niillä on suora ja selvä vaikutus tietoaineistojen lähteisiin, saatavuuteen ja tietosisältöön. Meri on luonnonelementtinä tyypillisesti vaihtelava, ja pystysuuntaisella ulottuvuudella on suurempi merkitys kuin maa-alueilla – merellä voidaan käsitellä vedenpintaa, vesipatsasta ja merenpohjaa eri tasoina. Meren monet, osittain päällekkäiset käyttötarkoitukset ja vuodenaikaisvaihtelun suuri vaikutus ympäristöön tekevät paikkatietotyöskentelystä haastavaa. Lisäksi tietoaineistoja on merialueilta tyypillisesti saatavilla vähemmän kuin maa-alueilta (esim. Vetter et al. 2012), ja tiedon geometria ja sisältö ovat yleensä epätarkempia. Useimmiten merellä tapahtuvan ihmistoiminnan sijainnista tai vaikutusalueesta ei ole tarkkaa tietoa. Maa- ja merialueiden vuorovaikutusjärjestelmien mallintaminen paikkatietoympäristössä voi myös olla hankalaa.

Tämä käsikirja pyrkii parantamaan merialuesuunnitteluun liittyvien paikkatietoprosessien tehokkuutta ja läpinäkyvyyttä viiden pääperiaatteen avulla:

- **Merialuesuunnittelun paikkatietotyöskentelyn on oltava päämäärätietoista, eikä saatavilla olevien aineistojen ohjaamaa**
- **Yhteistyön merkitys paikkatietoasiantuntijoiden ja muiden merialuesuunnitteluprosessin osapuolten välillä on ratkaiseva ensimmäisen periaatteen saavuttamiseksi**
- **Paikkatietoanalyysien lopputuloksen kannalta on välttämätöntä käyttää parasta saatavilla olevaa tietoa ja hylätä puutteelliset tai vanhentuneet tiedot**
- **On ehdottoman tärkeää dokumentoida käytetyt aineistot, menetelmät ja näihin liittyvät valinnat sekä rajoitteet prosessin jokaisessa vaiheessa**
- **Korkealaatuisia aineistoja jaetaan hallinto- ja sektorirajojen yli parhaan lopputuloksen takaamiseksi**

Näiden periaatteiden noudattaminen takaa, että paikkatiedot ja paikkatietomenetelmien tarjoamat mahdollisuudet hyödynnetään merialuesuunnittelussa parhaalla mahdollisella tavalla. Lisäksi varmistetaan, että päätökset perustuvat parhaaseen mahdolliseen tietoon, ja että sekä prosessia että sen lopputuloksia pystytään arvioimaan.

RUUMIANDMED MEREALA PLANEERIMISES

Ruumiandmed on üks mereala ruumilise planeerimise (Maritime Spatial Planning, MSP) nurgakive. See on esil planeerimisele eelnevas etapis, planeerimisala baasolukorra kaardistamisel, tegevuste vastastikuse mõju analüüsimisel ning planeerimisvõimaluste hindamisel ja edastamisel. Ruumiandmete edukas hindamine, kogumine, haldamine, analüüsimine ja visualiseerimine on tõenditel põhinevate planeerimisotsuste tegemise võti.

Euroopa Liidus on mereala ruumiline planeerimine riiklik või piirkondlik protsess sõltuvalt liikmesriigist. Ruumiandmete piiriülesed (cross-border) küsimused mõjutavad mereala ruumilise planeerimise protsesse igal skaalal, kuna riigid, maakonnad ja sektorid peavad arvestama oma naabritega. Majandustegevus sõltub sageli rahvusvahelistest ja mitut sektorit hõlmavatest koostoimetest. Elupaigad, liigid ja keskkonnaprobleemid ei tunne halduspiire ning neid võib mõjutada inimtegevus ka teisel pool piiri. Seetõttu tuleb käsitleda ruumiandmete haldamise erinevaid viise geograafiliste ja temaatiliste piiride vahel.

Maakasutuse planeerimisega võrreldes on ruumiandmete kasutamisel mereala planeerimisel palju lisaprobleeme. Omandiõigus ja jurisdiktsioon on merel erinev kui maal, ja nende praktikate varieeruvus halduspiiride vahel on suurem. Erinevused tuleb planeerimisprotsessis selgesõnaliselt arvesse võtta ning need mõjutavad ruumiandmete allikaid, kättesaadavust ja kvaliteeti. Meres ei ole staatilisi piire ja vertikaalset mõõdet tuleb vaadelda täpsemalt kui maad. Seega on multifunktsionaalsus ja hooajalised kasutused merel potentsiaalsed, kuid keerulised analüüsida. Veelgi enam, olemasolevaid andmeid on vähem (nt Vetter et al. 2012) ja konkreetseid andmetüüpe võib merel olla eriti keerukas koguda. Tavaliselt ei leidu saadaval olevaid ametlikke andmeid majandustegevuse mõjupiirkondade või mereruumi vaba-aja kasutamise kohta. Maismaa ja mere vastastikune mõju on mere keskkonna seisundi ja majandusliku arengu seisukohalt olulise tähtsusega, kuid see võib olla keeruline ümber kujundada konkreetseks ruumiliseks informatsiooniks.

Käesoleva käsiraamatu eesmärk on parandada ruumilise analüüsi tõhusust ja läbipaistvust mereala planeerimise protsessides. Me rõhutame viie põhimõtte tähtsust:

- **Ruumiandmega töötamine peab olema sihikindel ja töö ei tohiks juhinduda olemasolevatest andmematerjalid**
- **Esimese põhimõtte saavutamiseks on oluline geoinfosüsteemi spetsialistide ja teiste mereala ruumilise planeerimise protsessi kaasatud osapoolte vaheline koostöö**
- **Ruumiandmete analüüsi tulemuste seisukohast on vaja kasutada parimat kättesaadavat teavet ja eirata mittetäielikku või aegunud teavet**
- **Väga oluline on dokumenteerida ruumianalüüsi protsessi igas etapis kasutatud andmematerjalid, meetodid ja tehtud valikud**
- **Kõrge kvaliteediga andmematerjale jagatakse haldus- ja sektoripiiride vahel parima tulemuse tagamiseks**

Nende põhimõtete järgimine tagab ruumiandmete ja ruumiandmetoodikate pakutavate parima võimaliku kasutamise mereala planeerimises. Samuti on tagatud, et otsused põhinevad parimal võimalikul teabel, ja et nii protsessi kui ka selle tulemusi saab hinnata.

STRUCTURE OF THE GUIDE

This guide aims at presenting a step-by-step approach to utilising spatial data in MSP, with special attention given to cross-border issues. It seeks to complement existing MSP and spatial data analysis guides (see list of guides at the end of this document) in a concise and practice-oriented way, instead of forming a comprehensive manual. The steps of this guide may be linked to the general MSP workflow presented in UNESCO IOC's guide "Marine Spatial Planning – A step-by-step approach to ecosystem-based management" (Ehler & Douvere 2009).

This guide introduces each step of the MSP spatial data process in a general way and includes practical tips. It is targeted to people working with spatial information and spatial analysis in MSP, including planners, consultants, GIS specialists and involved researchers.

The guide is divided into four parts that are usually gone through in MSP processes, in this order:

I. Set stage for spatial data analysis in MSP (Steps 1-4)

II. Collect and manage spatial data (Steps 5-8)

III. Analyse spatial data – examine interactions (Steps 9-11)

IV. Visualise MSP on maps (Steps 12-14)

KIRJAN RAKENNE

Tässä käsikirjassa esitetään vaihe vaiheelta miten merialuesuunnittelun paikkatietotyöskentelyä voidaan jäsentää prosessiksi, erityisesti rajat ylittävien aineistojen ja analyysien osalta. Käsikirja täydentää aiemmin julkaistuja merialuesuunnittelun ja siihen liittyvien paikkatietoteemojen ohjeistuksia (ks. luettelo kirjan lopussa) selkeästi ja käytännönläheisesti. Kirjan esittelemät vaiheet ovat linkitettävissä yleiseen merialuesuunnitteluprosessiin, joka on kuvattu hyvin UNESCO IOC:n julkaisemassa teoksessa "Marine Spatial Planning – A step-by-step approach to ecosystem-based management" (Ehler & Douvere 2009).

Käsikirjassa käydään läpi merialuesuunnittelun paikkatietoprosessi yleisellä tasolla ja käytännön esimerkkien avulla. Kirja on suunnattu paikkatietojen ja merialuesuunnittelun parissa työskenteleville henkilöille, kuten aluesuunnittelijoille, konsulteille, paikkatietoasiantuntijoille ja tutkijoille.

Käsikirja on jaettu neljään osioon, jotka yleensä sisältyvät merialuesuunnitteluprosessiin:

I. Paikkatietoanalyysien valmistelu (Vaiheet 1-4)

II. Paikkatietoaineistojen kokoaminen ja käsittely (Vaiheet 5-8)

III. Paikkatietoanalyysit – vuorovaikutusten tutkiminen (Vaiheet 9-11)

IV. Merialuesuunnittelun karttavisualisointi (Vaiheet 12-14)

RAAMATU STRUKTUUR

Käesoleva käsiraamatu eesmärk on esitada järk-järgulise lähenemisviis ruumiandmete kasutamisele mereala ruumilise planeerimise valdkonnas, pöörates erilist tähelepanu piiriülestele küsimustele. Käsiraamatu eesmärk on täiendada olemasolevaid mereala ruumilise planeerimise ja ruumiandmete analüüsi juhendeid (vt. juhendite loetelu käesoleva käsiraamatu lõpus) kokkuvõtlikul ja praktilisel viisil. Raamatus esitatud etapid on seotud üldise mereala ruumilise planeerimise protsessiga, mida on hästi kirjeldatud UNESCO IOC väljaandes „Marine Spatial Planning - A step-by-step approach to ecosystem-based management" (Ehler & Douvere 2009).

Käsiraamat käsitleb mereala ruumilise planeerimise ruumilist planeerimist üldiselt ja praktilisi näiteid. Raamat on suunatud ruumiandmete ja mereala planeerimisega seotud ekspertidele, näiteks ruumilised planeerijad, konsultandid, geoinfosüsteemi (GIS) spetsialistid ja teadlased.

Käsiraamat on jagatud neljaks, tavaliselt mereala ruumilise planeerimise protsesse läbivaks osaks järgnevalt:

I. Ettevalmistused ruumiandmete analüüsiks (Etapid 1-4)

II. Ruumiandmete kogumine ja haldamine (Etapid 5-8)

III. Ruumiandmete analüüsimine – vastastikuste mõjude uurimine (Etapid 9-11)

IV. Mereala ruumilise planeerimise kaartidele visualiseerimine (Etapid 12-14)

FREQUENTLY USED TERMS

Base year – Determines the baseline of "current conditions" that will be used for mapping the baseline status of the marine plan area. It is relevant in Maritime Spatial Planning for selecting spatial data on the "current conditions" and rejecting outdated information.

CRS – Coordinate reference system.

Guidance document – A document accepted by the MSP coordinating group, and consisting of a review of criteria for spatial data inclusion, spatial data analysis goals, results of the data inventory, spatial data evaluation and spatial data harmonisation guidelines.

Metadata catalogue – A catalogue holding detailed metadata of all data created and used in the MSP spatial data analysis process.

MSP – Maritime (Marine) spatial planning.

MSP coordinating group – Any form of a group of authorities, experts and other stakeholders that coordinate the MSP process.

PGIS – Participatory GIS, i.e. collecting spatial information in digital format from experts, stakeholders and the general public using participatory methods.

Target year – Determines the timeframe for the plan and the identification of "future conditions". It is relevant in Maritime Spatial Planning e.g. when projecting "future conditions" or developing future scenarios.

USEIN KÄYTETYT TERMIT

Perusvuosi (base year) – Perusvuosi määrittelee suunnitelman "vallitsevia olosuhteita" edustavan ajankohdan. Perusvuoden määrittäminen on olennaista esimerkiksi saatavilla olevien aineistojen ajantasaisuuden arvioimiseksi.

CRS (coordinate reference system) – Koordinaattijärjestelmä.

Ohjaava dokumentti (guidance document) – Asiakirja, joka on hyväksytty koordinaatiotyöryhmässä ja sisältää rajaukset paikkatietoaineistojen kelpoisuudelle, paikkatietoanalyysien tavoitteille, aineistoinventoinnin tuloksille, sekä suuntaviivat aineistojen arviointiin ja harmonisointiin.

Metatietoluettelo (metadata catalogue) – Luettelo, joka sisältää kuvauksen kaikista paikkatietoprosessissa käytetyistä ja tuotetuista aineistoista.

MSP (Maritime/Marine Spatial Planning) – Merialuesuunnittelu.

Koordinaatiotyöryhmä (coordinating group) – Viranomaisista, asiantuntijoista ja muista sidosryhmään kuuluvista koostuva ryhmä, joka koordinoi merialuesuunnitteluprosessia.

PGIS (participatory GIS) – Osallistava paikkatietojärjestelmä tai -sovellus. Menetelmä digitaalisen paikkatiedon keräämiseksi asiantuntijoilta, suunnitteluprosessin osapuolilta ja kansalaisilta.

Kohdevuosi (target year) – Määrittelee ajankohdan, johon merialuesuunnitelma tähtää. Tämä on olennainen tieto koko prosessin kannalta, kun rakennetaan asiantuntijatietoon perustuvia skenaarioita.

KORDUVALT KASUTATUD MÕISTED

Baasaasta (base year) – Määrab kindlaks „praeguste tingimuste" lähtekoha, mida kasutatakse mereplaani ala algtaseme kaardistamiseks. Mereala ruumilises planeerimises on oluline ruumiandmete valimine „praegustel tingimustel" ja aegunud teabe kõrvale jätmine.

CRS (coordinate reference system) – Koordinaatide referentssüsteem.

Suunisdokument (guidance document) – Mereala ruumilise planeerimise koordineeriva töörühma poolt aktsepteeritud dokument, mis hõlmab ruumiandmete kaasamise kriteeriumide, ruumiandmete analüüsi eesmärkide, andmevarude tulemuste, ruumiandmete hindamise ja ruumiandmete ühtlustamise juhiste läbivaatamist.

Metaandmete kataloog (metadata catalogue) – Kataloog, mis sisaldab üksikasjalikke metaandmeid kõikide ruumiandmete analüüsi protsessis loodud ja kasutatud andmete kohta.

MSP (Maritime/Marine Spatial Planning) – Mereala ruumiline planeerimine.

Koordineeriv töörühm (coordinating group) – Mereala ruumilise planeerimise protsessi koordineerivad asutused, eksperdid ja muud sidusrühmad.

PGIS (participatory GIS) – Ruumiandmete kaasava meetodi põhimõtteid järgival viisil kogumine digitaalsel kujul ekspertidelt, sidusrühmadelt ja avalikult üldsuselt.

Sihtaasta (target year) – Määrätleb planeeringu ajakava ja "tuleviku tingimused". See on oluline kogu tuleviku stsenaariumide väljatöötamise protsessi jaoks.

I. SET STAGE FOR SPATIAL DATA ANALYSIS IN MSP

The first phase of the MSP spatial data process and the first section of this guide consists of preparations for data collection and analysis. The preparations should be made in close collaboration with the MSP coordinating group and include:

Step 1: **Identification of the plan area, spatial scale and timeframe**

Step 2: **Identification of thematic content and spatial interactions to be considered in the MSP process**

Step 3: **Identification of necessary spatial data**

Step 4: **Evaluation of the available data**

Since the first phase builds a "roadmap" for spatial data analysis by setting its goals and outlining the data and method selection, it is highly influential for the entire MSP spatial data process. It aims at guiding the spatial data analysis in a goal-oriented way (instead of data-oriented; i.e. order of Steps 2 and 3) and identifying best available data for the analyses. During this phase, decision-makers, planners, GIS specialists and researchers should join their forces to formulate the goals and methodology for spatial data analysis. In doing so, they need to account for the international, national and regional frameworks that guide MSP, relevant cross-boundary interactions and the potential and limitations set by geoinformatics.

I. SET STAGE FOR SPATIAL DATA ANALYSIS IN MSP

I. PAIKKATIETO-ANALYYSIEN VALMISTELU

Merialuesuunnittelun paikkatietoprosessin ensimmäisessä osiossa valmistellaan aineistonkeruuta ja paikkatietoanalyyseja. Valmisteluosio toteutetaan tiiviissä yhteistyössä koordinaatiotyöryhmän kanssa, ja se sisältää seuraavat vaiheet:

Vaihe 1: **Suunnittelualueen, tarkastelumittakaavan ja ajanjakson määrittely**

Vaihe 2: **Temaattisten sisältöjen ja alueellisten vuorovaikutussuhteiden määrittely**

Vaihe 3: **Tarvittavien paikkatietoaineistojen tunnistaminen**

Vaihe 4: **Aineistojen laadun arviointi ja yhdenmukaistaminen**

Käsikirjan ensimmäisessä osiossa muodostetaan "tiekartta" suunnitteluprosessin paikkatietoanalyyseille asettamalla yhdessä sovitut tavoitteet analyysien menetelmille ja tuloksille, joten ensimmäisen osion merkitys koko paikkatietoprosessille on merkittävä. Osion tavoite on suunnata paikkatietoanalyyseja sen mukaan, mikä on työn tavoite, eikä sen mukaan, mitä aineistoja tiedetään tai kuvitellaan olevan olemassa (so. vaiheiden 2 ja 3 järjestys). Tässä osiossa päätöksentekijät, suunnittelijat, paikkatietoasiantuntijat ja tutkijat muotoilevat yhdessä työn tavoitteet ja määrittelevät käytettävät menetelmät. Osion onnistumisessa on keskeistä ottaa huomioon kansainväliset, kansalliset ja alueelliset merialuesuunnitteluprosessiin vaikuttavat puitteet. Samalla tunnistetaan olennaiset rajojen ylittämiseen liittyvät tekijät sekä geoinformatiikan menetelmien tarjoamat mahdollisuudet ja niiden asettamat rajoitteet.

I. ETTEVALMISTUSED RUUMIANDMETE ANALÜÜSIKS

Mereala ruumilise planeerimise ruumiandmete protsessi esimene etapp ja käesoleva käsiraamatu esimene osa koosneb andmete kogumise ja analüüsi ettevalmistustest. Ettevalmistused peaksid toimuma tihedas koostöös mereala ruumilise planeerimise koordineeriva töörühmaga ja sisaldama järgmist:

Etapp 1: **Planeeringu ala, ruumilise skaala ja ajakava kindlaks määramine**

Etapp 2: **Mereala ruumilise planeerimise protsessis käsitletava temaatilise sisu ja ruumilise koostoime kindlaks määramine**

Etapp 3: **Vajalike ruumiandmete tuvastamine**

Etapp 4: **Ruumiandmete kvaliteedi hindamine ja ühtlustamine**

Kuna esimene etapp ehitab ruumiandmete analüüsi „teekaardi", seades selle eesmärgid ning kirjeldades andmete ja meetodite valikut, on see osa kogu mereala ruumilise planeerimise ruumiandmete protsessi jaoks väga mõjukas. Selle osa eesmärk on suunata ruumiandmete analüüsi vastavalt töö eesmärgile, mitte vastavalt sellele, millist andmematerjali on saadaval (st etappide 2 ja 3 järjekorras). Selles etapis teevad otsustajad, planeerijad, GIS-spetsialistid ja teadlased koostööd, et sõnastada ruumiandmete analüüsi eesmärgid ja määratleda kasutatavad meetodid. Selles osas on rõhk mereala ruumilist planeerimist juhtiva rahvusvahelise, siseriikliku ja piirkondliku raamistiku arvesse võtmine. Samuti määratakse kindlaks piiriülesusega seotud peamised tegurid ning geoinformaatika meetodite võimalused ja piirangud.

STEP 1. IDENTIFY PLAN AREA, SCALE AND TIMEFRAME

The first step aims at determining clear principles for setting the spatial and temporal frame for data inclusion and analysis.

VAIHE 1. SUUNNITTELUALUEEN, TARKASTELUMITTAKAAVAN JA AJANJAKSON MÄÄRITTELY
Ensimmäisen vaiheen tarkoitus on määrittää selkeät alueellisen ja ajallisen kattavuuden rajaukset paikkatietoanalyyseja varten.

ETAPP 1. PLANEERINGU ALA, RUUMILISE SKAALA JA AJAKAVA KINDLAKS MÄÄRAMINE
Esimene samm on määrata kindlaks selged põhimõtted andmete kaasamise ja analüüsi ruumilise ja ajalise raamistiku määramiseks.

1.1 DETERMINE EXACT BORDERS OF PLAN AREA

1.1 MÄÄRITTELE SUUNNITTELUALUEEN TARKKA RAJAUS

1.1 MÄÄRAKE PLANEERINGUALA TÄPNE PIIR

The plan area is often pre-defined on a regional and national level planning e.g. by national law. In cross-border MSP for example, the plan area may need to be negotiated at the beginning of the process. In addition, the exact borders in spatial data format need to be determined specifically for the MSP process. Negotiations may include the amount of terrestrial areas included in the MSP area, the inclusion of the exclusive economic zone and the selection between existing border data of different spatial resolutions.

PRACTICAL TIPS

- Involve MSP authorities and expert stakeholders in the process of negotiating and deciding borders.
- Clear borders particularly at the landward boundary are crucial for the initiation of the MSP process and data collection (Beck et al. 2009). They determine the authority of sea space and are needed from the beginning of the project in all communication related to the MSP process.
- Unless a precise plan area is dictated from above, prefer borders that conform to established administrative borders, such as the exclusive economic zone, territorial sea, counties and municipalities. You may also consider clear, established physical borders, such as drainage basins. Coverage of existing spatial data often follows established borders: thus, data harmonisation and geoprocessing is more straightforward when the borders of multiple data sets are perfectly in line.
- It may be useful to formally incorporate the coastal zone and its processes, although they can be taken into account without extending the plan area on the land.
- Note that MSP analysis boundaries do not have to coincide with management boundaries (and should not if major ecosystems/activities have a different distribution). Thus, the analysis area may be larger than the plan area and depend on the examined process (Figure 1).

1.2 DETERMINE SPATIAL SCALE FOR ANALYSES AND VISUALISATION

1.2 MÄÄRITTELE ANALYYSIEN JA VISUALISOINNIN ALUEELLINEN MITTAKAAVA

1.2 MÄÄRAKE ANALÜÜSIDE JA VISUALISEERIMISE RUUMILINE SKAALA

Consider relevant spatial scales or resolutions for the planning process, suitable for the size of the plan area and planning level (e.g. broad-scale strategic planning in large geographical areas or detailed zoning of sea use in small regions).

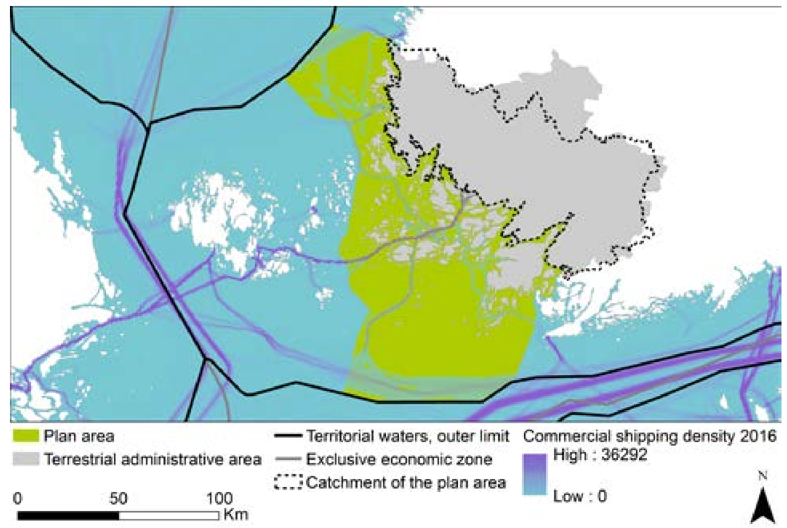


Figure 1. Part of an MSP plan area within some broader administrative, physical and economic regions. In the MSP process, analyses may be extended beyond the plan area to account for interactions across its boundaries (such as influence from the catchment, maritime traffic and interest from all parts of the administrative area).

PRACTICAL TIPS

- National and particularly cross-border MSP examines large geographical areas. Therefore, generalised instead of high-resolution spatial data may be more relevant for these MSP processes (corresponding to existing spatial datasets at a scale of 1:500 000 instead of 1:10 000) in case there are several scale-versions of the data.
- However, even within broad-scale strategic planning, it may be relevant to examine specific areas of intense human use or specific interactions in MSP at fine spatial scales. Thus, several spatial scales may be considered in a single MSP process.
- A typical scale for the final plans of national MSP ranges from 1:1 000 000 to 1:500 000 (e.g. 1:750 000 and 1:500 000 in Finland in 2018-2020).

1.3 DETERMINE TIMEFRAME: BASE AND TARGET YEARS

1.3 MÄÄRITTELE AJANJAKSO: PERUS- JA KOHDEVUODET

1.3 MÄÄRAKE AJAKAVA: BAAS- JA SIHTAASTAD

Before identifying data and analysis needs, a timeframe for the examination of the “current” conditions (base year) and the “future” (target year) should be determined. The base year determines the baseline of “current conditions” that will be used for mapping the baseline status of the plan area and as an important criterion for selecting relevant data. The target year may determine the timeframe for the plan and the identification of “future conditions”.

Note: In some cases, MSP aims at producing a regional plan of sea use based solely on current conditions and demand, and is in force until a new plan is compiled. In these cases, there may not be a need for setting a target year.

PRACTICAL TIPS

- The target year (or period) is usually dictated from above, and conforms to other spatial planning processes. The target year may have a large influence on the selection of relevant processes and analyses.
- The base year (or period) may be less regulated but highly relevant for spatial data acquisition. It should be selected to correspond with the beginning of the MSP process or earlier. Usually the most recent data sources are preferred despite the base year. However, sometimes the MSP process may last several years making the base year a relevant decision (MSP process 2015-2020, base period 2015-2018).
- Most importantly, the base year helps in determining which data are outdated. For example, shipping density data from 2010 are inevitably outdated if the base period is set to 2015-2018. On the other hand, high-resolution geological data from 2010 are still likely relevant in 2018.
- When a new planning cycle is initiated, a new base year is adopted and the input data are replaced with more recent versions. Similarly, towards the end of a very long planning process, it may be relevant to update spatial data to newer versions. This highlights the need for reporting the spatial analyses and accurate metadata in maps.

STEP 2. IDENTIFY THEMATIC CONTENT FOR ANALYSES

This step aims at ensuring that the spatial data analyses focus on meeting the objectives set in the MSP process.

VAIHE 2. TARKASTELTAVIEN TEMAATTISTEN SISÄLTÖJEN JA ALUEELLISTEN VUOROVAIKUTUSSUHTEIDEN MÄÄRITTELY
Toisessa vaiheessa varmistetaan, että paikkatietoanalyysit tehdään koko suunnitteluprosessin tarpeet huomioiden.

ETAPP 2. KÄSITLETAVA TEMAATILISE SISU JA RUUMILISE VASTASTIKUSE MÕJU KINDLAKS MÄÄRAMINE
Selle sammuga püütakse tagada, et ruumiandmete analüüs keskendub mereala ruumilise planeerimise protsessis seatud eesmärkide saavutamisele.

2.1 IDENTIFY THEMATIC SPATIAL INFORMATION NEEDS

2.1 TUNNISTA TEMAATTISET PAIKKATIETOTARPEET

2.1 TUVASTAGE TEMAATILISED RUUMIANDMETE VAJADUSED

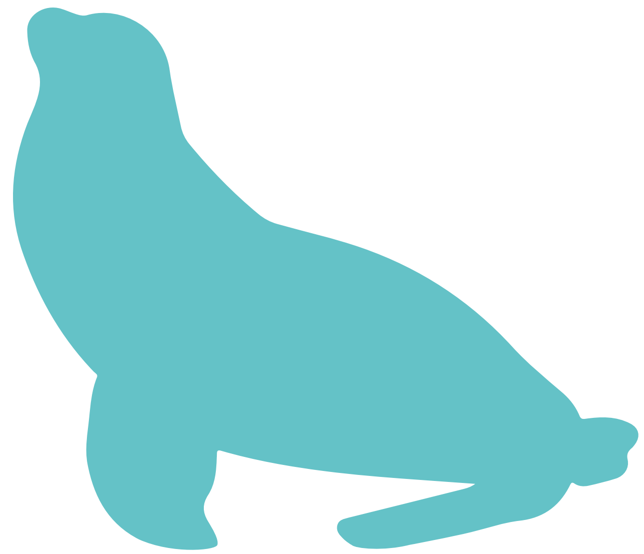
Identify those human activities, environmental values, target groups, existing plans and regulations that will be taken into account in the MSP. Utilise the knowledge of subject experts and acknowledge the general goals of the MSP process. This identification aims at focusing the analyses by selecting the MSP-relevant information out of the expanding amount of spatial data.

For example, one very broad way of classifying the thematic content could be borders, environment and human activities. A slightly more detailed classification could be (Fowler et al. 2010; Vetter et al. 2012):

- Jurisdictional boundaries
- Federal georegulations (policies in spatial format)
- Navigation and infrastructure (including nautical chart information and AIS shipping data)
- Human use (including actual patterns of behaviour)
- Marine habitat and biodiversity (including Natura 2000 habitats and key species)
- The physics and chemistry of the sea (temperature, salinity, circulation, waves, chemical composition)
- Geology and seafloor mapping (including bathymetry)

PRACTICAL TIPS

- Identify those MSP-relevant items (distribution of activities, patterns, plans and current conflict areas) that have a spatial distribution (two-dimensional, three-dimensional and temporal).
- Available spatial data should not guide the discussions at this point. Spatial data facilitates MSP but some spatial aspects of sea use questions cannot be put on a map using existing data. In addition, many aspects of MSP cannot be naturally represented in spatial format but may need to be taken into account in spatial analyses.
- Since MSP is a continuous process, the data plan can be ambitious. It can be arranged into steps, starting with the most fundamental data and seeking more detailed data at later stages of the process (Fowler et al. 2010).
- Instead of going through available data, it may be useful to start the identification process from outlining the desirable outputs (e.g. maps) that will be used for communicating and negotiating MSP, e.g. the current marine status, future scenarios and planning options. In other words, make a preliminary plan of which phenomena should be presented on maps to optimally communicate and negotiate MSP in each step of the process. The plan should then guide the data acquisition process.
- When involving experts, make them understand the relevant scale and the level of generality of the MSP process in question. Often cross-border MSP covers larger geographical areas and examines processes at a distinctly coarser spatial scale than other spatial planning processes. These characteristics should guide the selection of phenomena and the level of detail relevant to the process.
- Start the expert involvement from MSP officials and MSP experts across administrative borders: they will most likely have the best understanding of the most MSP-relevant properties and can help in delineating the data needs. Maintain balance between administrative units, since they may have different circumstances and views.
- After that, involve selected experts from different sectors, first introducing your overall data plan and then asking for their comments and suggestions. While keeping the overall plan in mind, allow the subject experts to influence the precise selection of environmental or socio-economic properties related to their sector. Maintain balance between administrative units and sectors.
- Evaluate the data plan keeping time constraints and balance between sectors in mind.
- For further inspiration, see available inventories on MSP data needs and availability, for example those from Fowler et al. (2010) and European Union (2017).



2.2 IDENTIFY SPATIAL ANALYSIS NEEDS

MÄÄRITTELE PAIKKATIETOANALYYSIEN TARVE

2.2 MÄÄRA KINDLAKS RUUMIANALÜÜSI VAJADUSED

Identify the knowledge that should be extracted from the information on current conditions (2.1) based on the goals of the MSP process. Typically, the planners and decision-makers are interested in the conflicts and compatibilities of human activities (use-use interactions) and between activities and the environment (use-ecosystem interactions). In addition, they may need to know about future conditions and the future distribution of activities. All of these questions have spatial dimensions (where and how much) and, depending on available data, may be answered with spatial data analyses.

PRACTICAL TIPS

- It is useful to start discussing spatial analysis needs already at this point, since it can take some time to develop the ideas. While analysis needs should guide the data identification process (Step 3), mapping of the current status of the plan area often brings up further analysis ideas at a later stage.

- Subject experts may be new to spatial analysis and need some examples of spatial analysis possibilities to trigger their imagination. The examples could showcase e.g. neighbourhood analysis (buffering), overlay analysis, trend surface analysis, spatial interpolation and spatial modelling. The best examples use real marine data and issues that could arise from the MSP context. For example, overlay analysis could be demonstrated with data of different types of restrictions and the analysis would determine the overlapping restrictions and restriction-free area. Determining caution zones (of different radiuses) around fairways (of different categories) and then calculating the amount of current fish catch inside the caution areas would be a practical example of neighbourhood analysis.

2.3 IDENTIFY DESIRED OUTPUTS: MAPS AND SPATIAL DATA PRODUCTS

2.3 MÄÄRITTELE PAIKKATIETOANALYYSIEN TOIVOTUT LOPPUTULOKSET: KARTAT JA PAIKKATIETOAINEISTOT

2.3 MÄÄRA KINDLAKS SOOVITUD VÄLJUNDID: KAARDID JA RUUMIANDMED

Identify maps and other spatial data products that are needed in the MSP process. A preliminary plan helps at focusing spatial data analyses on essential aspects and guiding the procedures in detail. The content of the plan will likely be a combination of the key thematic content and analysis results outlined in previous steps (2.1-2.2), for example:

- Map of plan area and surroundings
- Maps of the current distribution of key envi ronmental aspects, selected human activities and restrictions
- Maps of the future distribution of key environ mental aspects and selected human activities
- Maps of selected use-use conflicts and compatibilities: now and in the future
- Maps of selected use-ecosystem conflicts and compatibilities: now and in the future
- Maps of sea use scenarios / planning options
- Map of maritime spatial plan / zoning map: draft and final
- A spatial data portal containing all spatial data included in these maps, viewing and downloading functions

PRACTICAL TIPS

- A preliminary plan of the map outputs and other products based on spatial data is a good tool in planning the timetable and guiding spatial data collection and analysis efficiently.
- The guide of Ehler & Douvere (2009) gives an overview of the MSP process and each phase where maps are needed: Defining MSP boundaries ("Step 3 Task 3"), mapping current conditions ("Step 5"), mapping future conditions ("Step 6"), approving and communicating the plan ("Step 7") and possibly beyond. This guide may help to identify the number and content of maps and other products.
- The plan should be reviewed by the MSP coordinating group and people responsible for the processes' stakeholder involvement and communication.

2.4 CONSTRUCT TIMETABLE FOR SPATIAL DATA ANALYSIS

2.4 LAADI PAIKKATIETOANALYYSIEN AIKATAULU

2.4 KOOSTA RUUMIANDMETE ANALÜÜSI AJAKAVA

Construct a timetable for the main steps of spatial data analysis: data identification, collection, management, analysis and cartographic visualisation. A timetable will help the process to proceed efficiently and will aid in evaluating its progression and should be approved by the MSP coordinating group.

PRACTICAL TIPS

- Gather information of the size of the workforce, time constraints and the amount of data to be gathered, analyses to be done and maps to be made. Fixed dates, such as the publication dates of drafts and final plans form the basis of the timetable.
- Apart from the fixed dates, the timetable should be allowed to be flexible since new ideas will be adopted along the way and others abandoned. The timetable should be revised with the coordinating group during the MSP process.

STEP 3. IDENTIFY NECESSARY DATA

This step aims at guaranteeing that the goals of the MSP process guide the inclusion of spatial data and that the best available data are found.

VAIHE 3. TARVITTAVIEN PAIKKATIETOAINEISTOJEN TUNNISTAMINEN
Vaiheessa 3 varmistetaan, että merialuesuunnitteluprosessin tavoitteet ohjaavat paikkatietoaineistojen valintaa ja käyttöä, ja että parhaat olemassa olevat aineistot saadaan käyttöön.

ETAPP 3. VAJALIKE RUUMIANDMETE TUVASTAMINE
Selle sammuga püütakse tagada, et mereala ruumilise planeerimise protsessi eesmärgid juhivad ruumiandmete kaasamist, ja et kasutusse võetakse parimad kättesaadavad andmed.

3.1 IDENTIFY DATA SOURCES AND PROVIDERS

3.1 TUNNISTA PAIKKATIETOAINEISTOJEN LÄHTEET JA TOIMITTAJAT

3.1 TUVASTA RUUMIANDMETE ALLIKAD JA ESITAJAD

IIdentify providers of spatial data in the analysis area. Prefer providers that have legislative responsibility for original data, such as national and international agencies (e.g. Fowler et al. 2010).

PRACTICAL TIPS

- For national MSP processes, marine spatial data portals are being developed increasingly (e.g. the public "Meritieto" in Finland and "Estonian maritime spatial plan webmap" in Estonia) and will in the future hold the data that is nationally considered as the most relevant and best available. Generally, the portals are built on web interface services (such as WMS of WFS connections) in order to always display the most recent versions of data sets directly from the source. The providers responsible for original MSP-relevant spatial data typically include e.g. the national agencies for land survey, transport, environment and geology.
- In cross-border analyses, relevant data must be compiled from international and national sources and carefully evaluated to find corresponding information across borders. International marine organisations are often the best sources of seamless data with international coverage. However, the resolution of their datasets may not be adequate for some smaller-scale MSP processes. In the case of the Gulf of Finland and the Plan4Blue project, HELCOM (Baltic Marine Environment Protection Commission - Helsinki Commission) was identified as the main data provider. Other important sources in Europe include IMO (International Maritime Organization) and EMODnet (The European Marine Observation and Data Network).
- Subject experts are likely to know best the spatial data providers of different sectors. When working across borders, utilising the expertise of local actors is vital for identifying appropriate data providers.
- An example of a data provider inventory is given in the Appendix. The example presents international and national data providers that were utilised in the mapping of the current conditions of the Gulf of Finland and the Archipelago Sea in project Plan4Blue (April 2017).

3.2 IDENTIFY USEFUL SPATIAL DATA

3.2 TUNNISTA KÄYTTÖKELPOISET PAIKKATIETOAINEISTOT

3.2 TUVASTA KASUTUSKÕLBLIKUD RUUMIANDMED

Identify existing spatial data that correspond with the goals of the MSP process, identified in Step 2.1. The aim is to find spatial data that enable the intended spatial analyses (2.2) and the preparation of MSP-relevant maps and data sets (2.3). In addition, the spatial data must fulfil the criteria on spatial coverage (covering the entire plan area / analysis area; 1.1) spatial scale (1.2) and timeframe (1.3).

Document the data inventory well, collecting all important metadata at once and keep the documentation updated. This information includes e.g. credits, provider, spatial coverage, resolution, timeframe, format and the coordinate reference system (CRS). Metadata are needed in many steps throughout the MSP spatial data process and in all communication materials.

PRACTICAL TIPS

- In case there are several appropriate versions of the same data with different resolutions, spatial datasets of e.g. scale 1:500 000 may be more suitable for broad cross-border MSP than of scale 1:10 000. For example, there are several versions of data of the Finnish coastline but the finest resolution is unnecessarily heavy (large file size, slow processing and very different resolution compared to other data) for MSP of the entire Gulf of Finland. Moreover, some data providers supply fine-resolution data only in tiles, which slow down data management and processing. Fine-resolution data may be needed in MSP e.g. for detailed examinations of particular hotspot areas.
- Fine-resolution spatial data may be upscaled to coarser resolution to improve compatibility with other data, decrease file size and increase processing speed. Upscaling is an additional source of potential bias, there are many options for doing it in practice and must therefore be done with care.
- When working across borders, utilising the expertise of local actors is vital for identifying individual spatial data. For example, the local culture, environment, legislation and terminology differ and therefore local knowledge is needed to identify the appropriate data. In addition, national open data services have been increasingly translated into English, but it is not always the case. Often the data can be browsed in English but the actual data files, metadata or attribute tables are only available in local languages. Thus, knowledge of local languages is needed for interpretation.
- Cross-border spatial data of international organisations are often a good choice in cross-border MSP since they have already gone through a harmonisation process (of languages, resolution etc.). These data must be, however, carefully evaluated against local (original) spatial data and based on the selection criteria (1.1-1.3).

3.3 IDENTIFY SPATIAL INFORMATION IN NON-SPATIAL FORMAT

3.3 TUNNISTA EI-SPATIAALISESSA MUODOSSA OLEVAT AINEISTOT

3.3 TUVASTA RUUMIANDMED MITTE-RUUMILISEL KUJUL

The relevant spatial information needed to reach the MSP mapping and spatial data analysis goals (2.1-2.2) may be hidden in non-spatial data formats, such as tables or written documents. While some of this information is challenging to put on a map, it may be valuable for filling the spatial data gaps. Similar to spatial data (3.2), these data must fulfil the main criteria to be included (1.1-1.3) and must be documented well.

PRACTICAL TIPS

- Simple point location data may be stored and distributed in non-spatial spreadsheet or delimited text file formats even if they include geographical coordinate and projection information. These data are straightforward to transform into spatial data.
- Data in table format may contain information that enables locating it on a map. For example, some economic sector organisations or agencies store their registries in spreadsheet files or non-spatial databases. The data may include the full addresses or postal codes of each company and the addresses can be utilised to determine spatial coordinates for the companies (i.e. geocoding).
- Spatial information may exist in written formats in policy documents (legal acts such as international regulations and directives or national law). Some of this information includes coordinates and can be easily transformed into spatial data. Some of it is relative, e.g. "a zone of 5000 meters from the shoreline", which can be transformed into spatial data with spatial analysis methods. Most difficult to transform into spatial data are policies that apply to qualitatively described spatial extents, such as "shallow coastal waters".

STEP 4. EVALUATE DATA AND ACCEPT SPATIAL ANALYSIS PRINCIPLES

This step aims at ensuring that the best available spatial data are used and that inadequate spatial data are excluded from the analyses. In addition, this step outlines the principles for designing all data produced during the process.

Data are always imperfect, since it is just an abstraction of reality. It represents one time frame, a certain level of detail, has limited coverage and includes artefacts of the data acquisition process. Therefore, limits of the spatial data must be accepted and imperfect data must be used in MSP. However, spatial data must be updated and improved over time and used in an appropriate way, always using the best available data and taking into account its limitations.

VAIHE 4: AINEISTOJEN LAADUN ARVIOINTI JA YHDENMUKAISTAMINEN

Vaiheessa 4 varmistetaan, että analyyseissa käytetään parasta mahdollista aineistoa, ja että vain ohjaavassa dokumentissa mainitut ehdot täyttävät aineistot hyväksytään. Lisäksi vaiheessa 4 luonnostellaan periaatteet, joiden mukaan prosessissa tuotettavat uudet aineistot laaditaan ja kuvaillaan.

Aineistot ovat aina epätäydellisiä kuvauksia todellisuudesta. Aineistoissa olevat tiedot kuvaavat yhtä ajankohtaa tai ajanjaksoa jollakin tarkkuudella. Aineistojen kattavuus on rajallinen ja tietosisällöissä on aineiston tuotantotapaan liittyviä virheitä ja epätarkkuuksia. Aineistojen monenlaiset puutteet on siis hyväksyttävä, mutta merialuesuunnittelussa on aina pyrittävä ylläpitämään uusinta ja tarkinta tietoa päätöksenteon pohjana. Samalla on kuitenkin tiedostettava aineistojen muotoon ja sisältöön liittyvät rajoitukset.

ETAPP 4. RUUMIANDMETE KVALITEEDI HINDAMINE JA ÜHTLUSTAMINE

Selle sammuga püütakse tagada, et analüüsides kasutataks parimaid kättesaadavaid ruumiandmeid, ja et aktsepteeritakse ainult sellist andmematerjali, mis vastab suunisdokumendis nimetatud tingimustele. Lisaks kavandatakse 4. etapis protsessi käigus toodetud uute andmematerjalide loomise ja kirjeldamise põhimõtteid.

Andmematerjalid on alati tegelikkuse ebatäiuslikud kirjeldused. Andmetes olev informatsioon kujutab endast ühte ajahetke, teatud üksikasjalikkust, piiratud katvust ja sisaldab andmete kogumise protsessi artefakte. Seega tuleb aktsepteerida mitmesuguseid andmelünki, kuid mereala ruumiline planeerimine peab alati olema suunatud kõige ajakohasema ja täpse teabe säilitamisele otsuste tegemisel. Samal ajal peab siiski teadvustama andmematerjali vormi sisu ja piiranguid.

4.1 EVALUATE DATA GAPS, OVERLAP AND DISCREPANCIES ACROSS BORDERS

4.1 ARVIOI PUUTTEET JA PÄÄLLEKKÄISYYDET AINEISTOJEN KATTAVUUDESSA SEKÄ HALLINTOALUEIDEN VÄLISET EROT AINEISTOISSA

4.1 HINDA ANDMETE LÜNKI, KATTUMIST JA PIIRIÜLESEID ERINEVUSI

Document all gaps and discrepancies in the spatial data to facilitate the planning of the next steps in the MSP spatial data analysis. Information on the persisting data gaps must be passed through the entire spatial data analysis process and clearly stated in all communication materials to allow appropriate evaluation of the results. The gaps may include:

- Missing spatial datasets for the entire plan area
- Missing datasets for specific parts of the plan area / analysis area
- Limitations in the density of observations, resolution, quality or relevant metadata

Possible discrepancies particularly across borders should be documented. The discrepancies (e.g. differences in spatial resolution, measuring scales, variables and classification) become most evident when neighbouring administrative areas share a shoreline and there is a sharp change in spatial data at the border.

PRACTICAL TIPS

- Although MSP often relies on existing data, identified information gaps may be in some cases filled by collecting a limited amount of new data. Moreover, for example, correlative spatial modelling (7.2) can be utilised to cost efficiently construct new datasets based on limited observations.
- When working across national borders, there may be higher-resolution data for territorial waters than for international waters. For example, in the Gulf of Finland, there is generally a zone of coarser-resolution data between the territorial waters of Finland and Estonia.
- Spatial data of actual human use patterns is often missing or underrepresented in MSP (such as leisure boating; St Martin & Hall-Arber 2008) if this use is not licenced or regulated. In addition, spatial data of cultural values (cultural heritage) is often less available than other data. These gaps highlight the need for identifying human activities and cultural values that are relevant for MSP and have spatial dimensions and finding solutions for dealing with the lack of specific information (e.g. by collecting or modelling new data [Step 7] or accepting the lack of spatial information).
- Overlap in datasets is usually a positive problem but must be dealt with. It becomes important when merging individual datasets of different origin into seamless data layers.

4.2 PREPARE SPATIAL DATA HARMONISATION PRINCIPLES

4.2 LAADI PERIAATTEET AINEISTOJEN HARMONISOINNILLE

4.2 KOOSTA RUUMIANDMETE ÜHTLUSTAMISE PÕHIMÕTTED

Outline principles for harmonising spatial data. Harmonisation means that the size, scale, attributes, data types, CRS and file types of data (from different sources) are unified to increase technical and semantic interoperability. This facilitates analyses and other uses of the data. The principles include general ones that apply to all new and derived spatial data and some that are specific to individual thematic content. They include:

- Choosing whether to harmonise data or not
- Coverage of new and derived spatial data (general)
- Attribute table language (general), structure and common terminology (specific)
- Resolution (general with specific exceptions)
- Data type (general; vector, raster / ESRI shapefile, MapInfo tab, AutoCAD dwg)
- Coordinate reference system (general)

Input data across thematic sectors and administrative borders should not be harmonised at the initial source, due to the high and growing number of providers, versions and uses. Instead, spatial data differences can be dealt with during the MSP process to create harmonious intermediate data layers for analyses and harmonious output data for publication.

PRACTICAL TIPS

- If the data are only used internally for the analyses and map production of the MSP process, there may be no need to harmonise e.g. coordinate reference systems (CRS) and data formats. However, if the datasets are publicly redistributed, e.g. published in a geoportal for further use, even the more technical characteristics of the data should perhaps be uniform.
- Analysis needs dictate the need for data harmonisation further. For example, some statistical analyses, geoprocessing methods or raster calculation require a uniform resolution of the data, a uniform cell size of raster data or a uniform CRS. These harmonisation needs can be fixed along the way through the process.
- Typical discrepancies that may need harmonisation: resolution (observation density and cell size) of the data, discontinuities in the data from different areas, data type (feature or raster) and language and terminology of the attributes.

4.3 GET ACCEPTANCE FOR GUIDANCE DOCUMENT FROM COORDINATING GROUP

4.3 PYYDÄ KOORDINAATIOTYÖRYHMÄN HYVÄKSYNTÄ OHJAAVALLE DOKUMENTILLE

4.3 HANGI SUUNISDOKUMENDILE KOORDINEERIVA TÖÖRÜHMA NÕUSOLEK

Get an acceptance from the MSP coordinating group on accepting or rejecting spatial data and principles for harmonising it. All parties need to be involved in the decision. This is done by reviewing Steps 1-4 into a single document, including:

- Criteria for spatial data inclusion (Step 1)
- Spatial data analysis goals (Step 2)
- Results of the data inventory (Step 3)
- Spatial data evaluation (4.1)
- Spatial data harmonisation principles (4.2)

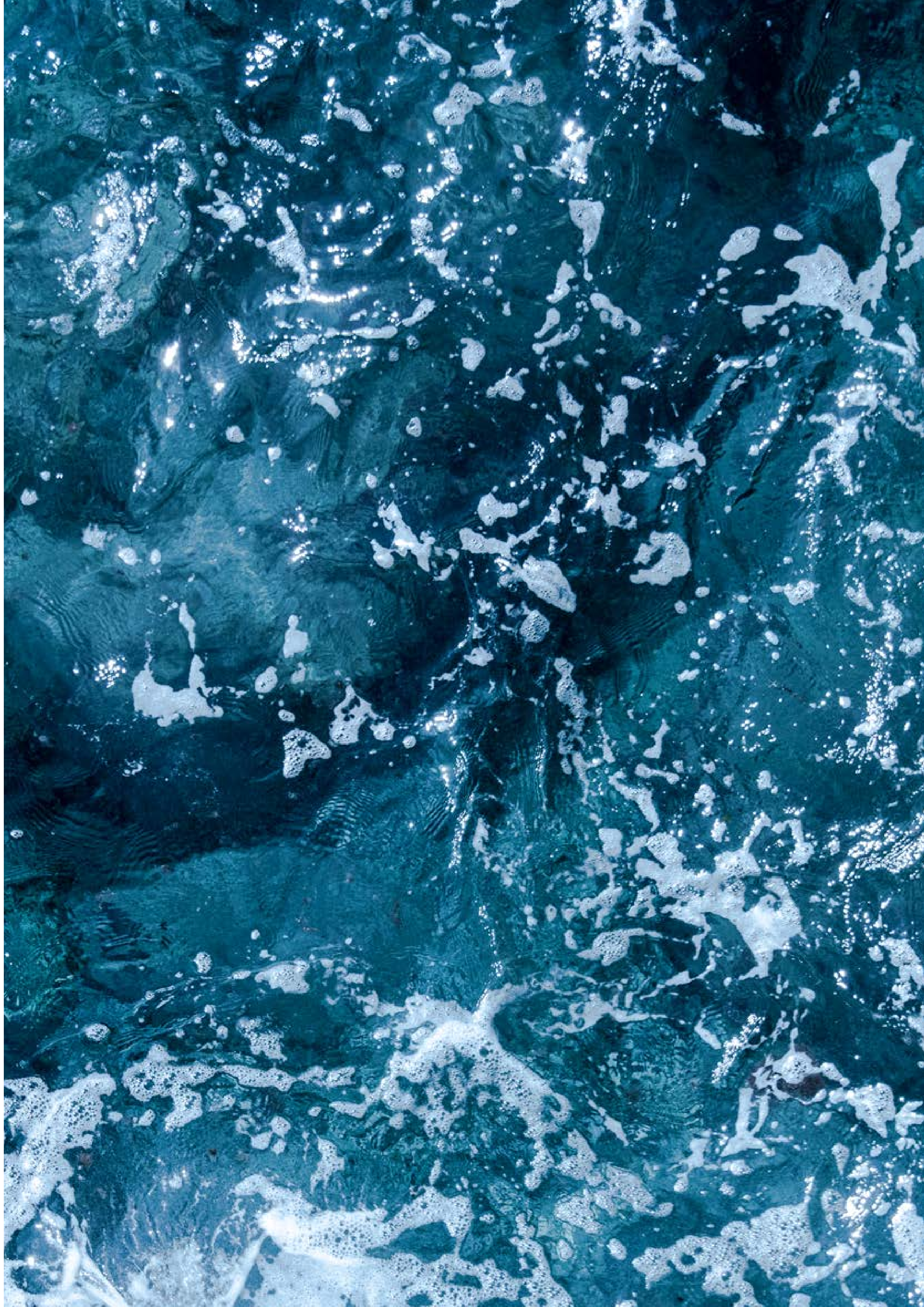
The review will later serve as a **guidance document** for the spatial data analysis in the MSP process.

At this point, the best spatial data should be selected and inadequate data left out from analyses. Particularly in cross-border MSP, severe spatial data gaps or discrepancies across borders (4.1), their acceptability and principles for dealing with them must be negotiated, involving all parties.

Resources for the collection of new data are typically minimal in MSP. Efforts should be targeted to largest gaps in the knowledge, which may be the implicit knowledge of private actors and the true location of economic and social activities on the sea (registered addresses of firms are often insufficient for example for analysing human impact on the sea). Moreover, data production should aim at balancing the differences in the amount of information between administrative units and sectors.

PRACTICAL TIPS

- If all parties accept each other's data as it is, there may be no need to harmonise them. If they don't, existing data can be harmonised in different ways (Phase II) to reduce the discrepancies, or accept that no adequate spatial data exists.
- Criteria need to be negotiated to solve data overlap issues when creating seamless data layers. For example, if two states and one international organisation have data of the same phenomenon and same area, which of the three data are used for the overlapping area? The one with the highest resolution or the one with largest coverage? In the Plan4Blue case study, data of the international provider (HELCOM) with largest coverage was preferred, but evaluated against national data at a later stage.



II. COLLECT AND MANAGE SPATIAL DATA

In this second phase, spatial data are gathered, combined and managed in a way that it can be analysed, distributed and visualised efficiently in the MSP process. Particularly, data from different sides of administrative and sectoral borders need to be harmonised for analysis and distribution and missing data collected. Output data (new data and products of the MSP process) need to follow standards at multiple administrative levels and need to be distributed efficiently to facilitate the next planning cycles as well as cross-border cooperation.

II. PAIKKATIETO-AINEISTOJEN KOKOAMINEN JA KÄSITTELY

Toisessa osiossa paikkatietoaineistot kootaan eri lähteistä, ja niiden muoto ja sisältö harmonisoidaan analysointia varten. Työvaiheet ovat välttämättömiä myös aineistojen ja tulosten tehokkaan jakelun ja visualisoinnin varmistamiseksi. Hallinto- tai sektorirajojen eri puolilta tulevien aineistojen geometrian ja tietosisällön harmonisointiin tulee kiinnittää erityistä huomiota, ja aineistojen kattavuudessa havaitut puutteet on pyrittävä poistamaan. Tuloksena saatavien aineistojen on mukauduttava eri hallinnon tasojen standardeihin, ja niiden myöhempi käytettävyys rajat ylittävässä merialuesuunnittelussa on varmistettava.

II. RUUMIANDMETE KOGUMINE JA HALDAMINE

Teises osas koostatakse ruumiandmekogumid erinevatest allikatest ja ühtlustatakse nende vorm ja sisu eesolevate analüüsiprotsesside jaoks. Teise osa tööetapid on samuti olulised andmete ja tulemuste tõhusa levitamise ja visualiseerimise tagamiseks. Erilist tähelepanu tuleks pöörata eri haldus- või sektoripiiridest pärineva materjali geomeetria ja andmete sisu ühtlustamisele ning kõrvaldada tuvastatud puudused. Saadud materjalid peavad vastama erinevate haldustasandite standarditele ja nende hilisem kasutatavus piiriüleses mereala ruumilises planeerimises peab olema tagatud.

STEP 5. COLLECT EXISTING DATA

In this step, the best available data identified in the previous steps (and reviewed in the guidance document; 4.3) is collected. Detailed metadata are collected and a metadata catalogue is established.

VAIHE 5. OLEMASSA OLEVIEN AINEISTOJEN KERÄÄMINEN
Parhaat saatavilla olevat, aiemmissa vaiheissa määritellyt paikkatietoaineistot kootaan suunnitteluprosessin käyttöön. Aineistojen tarkat kuvailutiedot dokumentoidaan metatietoluetteloon.

ETAPP 5. OLEMASOLEVATE ANDMETE KOGUMINE
Selles etapis kogutakse eelmistes etappides (ja juhisdokumendis läbi vaadatud) parimad kättesaadavad andmed. Andmete täpne kirjeldus dokumenteeritakse metaandmete kataloogis.

5.1 ESTABLISH METADATA CATALOGUE FOR MSP DATA

5.1 LAADI METATIETOLUETTELO

5.1 KOOSTA METAANDMETE KATALOOG

Establish a **metadata catalogue**, where the metadata of all the spatial data used in the MSP process is gathered. The guidance document and its data inventory can be used as a template for the catalogue. The catalogue will hold detailed information on the:

- Original version existing data
- Derived spatial data (with information on the input data and methods)
- Modelled spatial data (with information on the input data and methods)
- Spatial data collected within the MSP process

The metadata should include e.g.:

- Original spatial data: credits, provider, spatial coverage, resolution (spatial, spectral, temporal, radiometric), attributes and their classification, timeframe, format, CRS, rights, methods for creating the data, restrictions (errors, disclaimers, gaps).
- Derived spatial data: information (see list above) on the original spatial data and potential intermediate versions; methods used to analyse and transform the data, restrictions (errors, disclaimers, gaps).

5.2 ACCESS EXISTING DATA

5.2 VARMISTA PÄÄSY OLEMASSA OLEVIIN AINEISTOIHIN

5.2 VEENDU OLEMASOLEVATELE ANDMETELE JUURDEPÄÄSUS

Follow the guidance document (4.3), accepted by all parties, to access existing data (spatial or non-spatial) and its metadata. The document outlines:

- Where to get the data (data providers)
- Which version of the data to collect
- The intended use of the data

The intended use of the data helps in selecting e.g. between spatial data formats (vector or raster) and between downloadable files and web-interface services.

Collect all relevant metadata of the original data and include it in the metadata catalogue (5.1).

PRACTICAL TIPS

- Consider the use of OGC web-interface services (e.g. WMS, WFS) which enable direct access to updated maps and data, provided by many national and international authorities (e.g. interfaces of HELCOM: http://www.helcom.fi/baltic-sea-trends/data-maps). When using web interface services, the data layers do not need to be archived as files. On the other hand, with using web interfaces, the version of the data layers cannot be controlled in a similar way as with working with files. At the moment, most available web-interface services are web map services (WMS) that allow the distribution of map visualisation as images. The use of these map images is much more limited than of individual spatial data layers (e.g. shapefiles).
- In the case that interface surfaces are impractical, download and store spatial data files on hard drives and/or cloud services.

STEP 6. HARMONISE SPATIAL DATA

In this step, the best available data collected in Step 5 are harmonised following the harmonisation principles outlined in the guidance document (4.3) in preparation for spatial analyses. All changes to the original data are documented in the metadata in detail.

The content introduced in this this step apply to new data layers (either new survey data or layers derived from existing data sources; Step 7) produced during the MSP process. In addition, some of the content apply to the preparatory phase of certain spatial analyses and for re-publishing data in MSP data portals.

VAIHE 6. PAIKKATIETOAINEISTOJEN HARMONISOINTI

Vaiheessa 5 kerätyt paikkatietoaineistot muokataan yhteensopiviksi ohjaavassa dokumentissa (4.3) esitettyjen harmonisointiperiaatteiden mukaisesti. Alkuperäisiin aineistoihin tehtävät muutokset kirjataan yksityiskohtaisesti metatietokuvaukseen.

Vaiheen 6 toimenpiteet koskevat uusia, suunnitteluprosessin aikana tuotettavia paikkatietoaineistoja (joko itse tuotettu kokonaan uusi aineisto tai olemassa olevista aineistoista johdettu aineisto). Jotkin toimenpiteet koskevat myös paikkatietoanalyyseja valmistelevia aineistonmuokkauksia tai aineistojen valmistelua esimerkiksi verkkokarttajulkaisua varten.

ETAPP 6. RUUMIANDMETE HARMONISEERIMINE

Etapis 5 kogutud ruumiandmekogumeid redigeeritakse vastavalt suunisdokumendis (4.3) esitatud ühtlustamispõhimõtetele. Algandmetele tehtud muudatused dokumenteeritakse üksikasjalikult metaandmetes.

Etapp 6 meetmed kehtivad planeerimisprotsessi käigus toodetud uute ruumiandmekogumite suhtes (kas tervenisti loodud uus materjal või olemasolevatest andmeallikatest tuletatud materjal). Mõned meetmed kehtivad ka failide redigeerimiseks või ruumiandmete analüüsiks vajalike andmete ettevalmistamiseks, näiteks online-kaardi avaldamiseks.

6.1 ADJUST COVERAGE OF SPATIAL DATA LAYERS

6.1 MITOITA AINEISTOT KATTAMAAN SUUNNITTELUALUE

6.1 MUUDA RUUMIANDMETE ULATUST

Merge and clip spatial data layers and filter map items to create perfectly sized data for analyses. Use the selected spatial extent (1.1) to size new spatial data layers. This harmonisation can be done for following reasons:

- Best available spatial data often originates from different sources (e.g. national or municipal) and is therefore spatially discontinuous. This may not be a problem when visualising the data on maps, but they need to be merged to enable spatial analyses.
- Spatial data supplied by authorities of a larger administrative area often contain large amounts of data outside the plan area (or analysis area). There may be a need to exclude those data either for visualisation purposes or for speeding up data analysis.

- Spatial data layers may contain large amounts of map items that are not useful for the MSP process. The useful map items can be extracted from the original data layers.

Document all changes to the spatial data by updating the metadata.

PRACTICAL TIPS

- Geoprocessing methods can be used to "merge" feature layers of the same data type (point, line or polygon) or to "mosaic" raster layers.
- Larger data are more time-consuming to process than smaller. Feature or raster layers can be "clipped" to a specific extent for example by using a polygon layer of the plan area as a "clip feature".
- For example, only the sea areas included in a polygon layer of multiple land use classes, or only the largest lakes may be needed for an analysis. These features can either be temporarily "filtered" from the layer or queried and permanently saved as a new layer.

6.2 HARMONISE ATTRIBUTE TABLES

6.2 HARMONISOI OMINAISUUSTIETOTAULUKOT

6.2 ÜHTLUSTA ATRIBUUTIDE TABELID

Harmonise attribute tables that have discrepancies in the selection of attributes, terminology, classifications, value field properties or languages across administrative or sectoral borders. Use the same attribute table structure for all new spatial data layers. In addition, potential errors in the attribute information need to be corrected. The harmonisation of attribute information enables further analyses of merged spatial data layers and makes comparison of spatial data more efficient.

Document all changes to the spatial data by updating the metadata.

PRACTICAL TIPS

- When data from different sources are combined to create merged data layers, the attribute tables are not automatically usable. Unless all columns in all initial layers are identical in terms of column types and names, the new attribute table will include all columns from all initial layers and a large number of empty cells. If the resulting layer is to be publicly redistributed, the entire attribute table should be harmonised and the appropriate metadata prepared. If the resulting layer is only used for analysis or visualisation on a map, it may be more practical to calculate one or two new columns that combine information from several initial columns (e.g. a new column "Size" that contains information either from an initial column "Koko" (in Finnish) or "Suurus" (in Estonian), depending on the origin of a feature).
- Note that often local expertise is needed to interpret and translate attributes. In addition, sometimes there may be notable differences in local classifications (of e.g. municipalities, degree of conservation status or types of fairway areas). Local expertise should be used to harmonise the attribute table in these cases, which will influence the selection of comparable classes across borders for visualisations and analyses.

6.3 HARMONISE SPATIAL RESOLUTION

6.3 HARMONISOI ALUEELLISET RESOLUUTIOT

6.3 ÜHTLUSTA RESOLUTSIOON

Decrease the resolution of (upscale) specific spatial data to make multiple otherwise comparable data sets compatible, or to make the data more suitable for the general spatial scale of the MSP process (1.2). Use the selected resolution for designing all new spatial data layers. Utilise international (often coarser spatial scale) data to smooth national boundaries and fill spatial gaps.

Document all changes to the spatial data by updating the metadata.

PRACTICAL TIPS

- If multiple data sets are merged for visualisation purposes only, the individual layers may not need to be physically merged into one. However, if a single layer is needed for analyses, geoprocessing tools are used to merge (feature layers) or mosaic (raster layers) the data. In the latter case the overlap of e.g. international and national datasets should first be removed. Moreover, the resulting layer should perhaps be resampled to a uniform spatial resolution, in practice the one used in the coarsest dataset or at least the coarsest resolution should be documented. This is vital particularly if statistical analysis or modelling will be applied on the merged layer.

6.4 HARMONISE DATA TYPES

6.4 HARMONISOI AINEISTOTYYPIT

6.4 ÜHTLUSTA ANDMETÜÜBID

Utilise geoprocessing methods to convert existing data to different map item types and formats; i.e. between point, line and polygon feature types and between feature and raster data types. The harmonisation aims at enabling specific spatial analyses or improving the visual appearance of maps. Use the preferred data types for designing all new spatial data layers.

Document all changes to the spatial data by updating the metadata.

PRACTICAL TIPS

- For example, a raster layer of shipping density can be converted to vector data of shipping areas. All raster cells with values indicating shipping (e.g. > 0) can be extracted and converted to polygons by merging adjacent cells. Similar to other transformations, the user has a distinct influence on the result since different options can be chosen for selecting e.g. the minimum size of individual polygons and smoothing boundaries.

6.5 HARMONISE COORDINATE REFERENCE SYSTEM AND FILE FORMAT

6.5 HARMONISOI KOORDINAATTI-JÄRJESTELMÄT JA TIEDOSTOMUODOT

6.5 ÜHTLUSTA KOORDINAATIDE REFERENTSSÜSTEEMID JA FAILIVORMINGUD

Utilise geoprocessing methods to reproject spatial data into selected CRS, and use the selected CRS uniformly to reference new spatial data layers. This harmonisation aims at enabling specific spatial analyses and to provide conveniently uniform spatial data to end-users.

Document all changes to the spatial data by updating the metadata.

Note: For map visualisation and many spatial analyses, the data do not have to been transformed, since GIS software are able to handle data with different CRS's and of different file types.

PRACTICAL TIPS

- Usually it is practical to choose a CRS that is designed for a slightly larger area around the project area. For example, Finnish and Estonian national datasets are mostly prepared to a national CRS. When data are stored for use in the broader (in this case international) cross-border context, a practical choice is the same CRS that is used by HELCOM, an international organisation operating in the Baltic Sea region.
- File formats of less often used GIS software may need to be converted to more universal formats before they can be viewed and analysed in another software. Tools for the transformations can often be found online or as plugins. When e.g. the data will be publicly redistributed, the file formats can be harmonised for the convenience of the users. The uniform file format for can be chosen from a variety of choices for raster (e.g. GeoTIFF, ESRI grid, binary file, JPEG2000) and feature data (e.g. xyz, MapInfo TAB, ESRI Shapefile, geodatabase).

II. COLLECT AND MANAGE SPATIAL DATA

STEP 7. PRODUCE SPATIAL DATA

In this step, new spatial data are produced from existing data with geocoding or correlative spatial modelling. In addition, severe data gaps are filled by collecting new original spatial data, following the guidance document (4.3).

When producing new spatial data, the principles for spatial data harmonisation (introduced in Step 6 of this guide) are followed. In addition, detailed metadata are created, added into the metadata catalogue (5.1) and kept up-to-date when changes are made.

VAIHE 7. PAIKKATIETOAINEISTOJEN TUOTTAMINEN

Suunnitteluprosessissa on tarpeen tuottaa uusia paikkatietoaineistoja joko hyödyntämällä olemassa olevia aineistoja tai täydentää aineistojen kattavuuden puutteita keräämällä uutta paikkatietoaineistoa ohjaavan dokumentin (4.3) periaatteiden mukaisesti.

Uuden aineiston tuotannossa noudatetaan vaiheessa 6 luotuja aineistojen harmonisointiin liittyviä käytäntöjä. Lisäksi uusista aineistoista laaditaan mahdollisimman täydelliset metatietokuvaukset, ja aineistojen tiedot tallennetaan metatietoluetteloon (5.1).

ETAPP 7. UUTE RUUMIANDMETE LOOMINE

Planeerimisprotsessis on vaja luua uusi ruumiandmekogumeid kas kasutades olemasolevaid andmeid või täiendades andmete katvuse puudusi kogudes uusi ruumiandmeid suunisdokumendi (4.3) põhimõtteid järgides.

Uute ruumiandmete koostamisel järgitakse käesoleva käsiraamatu 6. etapis esitatud ruumiandmete ühtlustamise põhimõtteid. Sellele lisaks koostatakse uutele ruumiandmetele üksikasjalikud metaandmete kirjeldused, ja andemete ajankohastatud muudatused salvestatakse metaandmete kataloogi (5.1).

7.1 DERIVE NEW SPATIAL DATA FROM EXISTING DATA

7.1 TUOTA UUSIA PAIKKATIETOAINEISTOJA OLEMASSA OLEVIEN AINEISTOJEN AVULLA

7.1 KOOSTA UUSI RUUMIANDMEID OLEMASOLEVATEST ANDMETEST

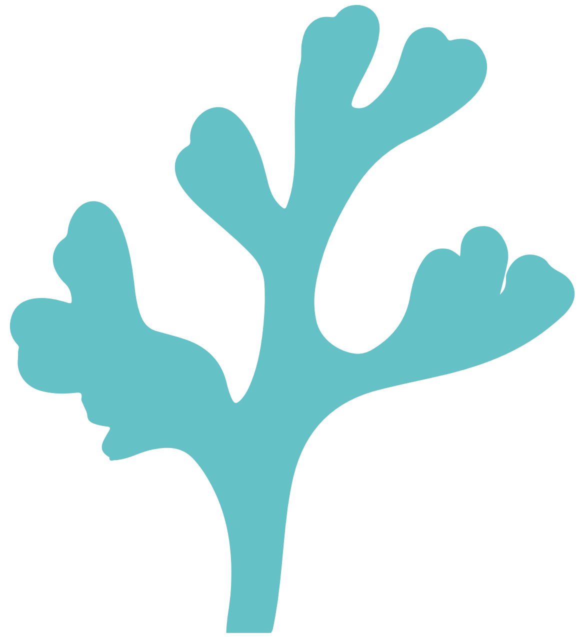
Following the guidance document (4.3), derive new spatial data layers from existing spatial data and from other data types. In practice, this means:

- Utilising existing map items to calculate new map items with new attribute information with geoprocessing methods
- Utilising existing raster layers (e.g. satellite and aerial imagery and potentially other types of information) to calculate new spatial information as raster layers
- Geocoding spatial information in tables and policy documents

Follow the spatial data harmonisation principles when creating new layers. Create detailed metadata that includes information of the original data and utilised methods.

PRACTICAL TIPS

- For example, business registers often include addresses (full street address, postal code or municipality) that can be used to geocode the postal addresses of firms (and create point data). GIS software typically have plugins for geocoding addresses using Open Street Map or Google Maps data as reference. The success of geocoding is strongly dependent on the quality of the address data.



- For example, point based population data can be used to calculate population densities for administrative units (joining) or transformed to density surfaces of different types (point density, kernel density) for visualisation purposes. Land areas can be derived from sea area by using geoprocessing tools.

7.2 APPLY CORRELATIVE SPATIAL MODELLING TO PRODUCE NEW SPATIAL LAYERS

7.2 KÄYTÄ KORRELATIIVISIA ALUEELLISIA MALLINNUSMENETELMIÄ UUDEN PAIKKATIEDON TUOTTAMISEKSI

7.2 RAKENDAGE KORRELATIIVSET RUUMILIST MODELLEERIMIST UUE RUUMILISE KIHI LOOMISEKS

When high-resolution survey data are not available, apply correlative spatial modelling to cost-efficiently construct new datasets based on limited observations. Use appropriate survey data as input and scientifically evaluated methodology and report analyses following scientific principles.

Document the input data and modelling methods carefully (e.g. size or resolution of the input data, citation to the methodology, main restrictions), to give a realistic impression of the reliability of the results. Abandon results that do not pass statistical evaluation from further use in MSP.

In correlative spatial modelling, observations are mathematically related to those characteristics of the environment that are well-known (i.e. predictors: spatial data with coverage of the entire plan area / analysis area). Using the mathematical equations, the probable distribution of the observed phenomenon is calculated to the entire geographical area. By adjusting the predictor data, the probable distribution of the observed phenomenon can be projected to future conditions or other areas, with limitations.

PRACTICAL TIPS

- For example, species distribution modelling (habitat modelling) is used to calculate the probable distribution of the species richness of seabed flora based on limited observations and their correlation with physical and chemical characteristics of the seabed.
- Furthermore, climate envelope modelling calculates e.g. the probable future distribution of the species richness of seabed flora in different climatic conditions (or e.g. sea use scenarios) by replacing the current-state bio-physical layers with data of the future environment.

Figure 2. Stakeholder mapping in the Plan4Blue cross-border workshop in June 2017. Basemaps (including restricted military areas, nature conservation areas, fairways, ports, pipelines, dumping sites, main roads and railroads, urban areas and place names) of the plan area were printed on large canvases. The maps were either A) covered with plastic and sketched on or B) "played" on. The drawings were documented and later interpreted and digitised to create digital spatial data, including point, line and polygon layers for each four blue economy sector (Pöntynen & Erkkilä-Välimäki 2018; photograph: Anne Erkkilä-Välimäki).

7.3 COLLECT NEW DATA

7.3 KERÄÄ UUSIA AINEISTOJA

7.3 KOGU UUSI ANDMEID

Based on the guidance document, target efforts of collecting new original data to spatial data that fills the most severe information gaps. Design the data collection by considering uses beyond MSP and the current planning cycle. Create detailed metadata and include it in the metadata catalogue.

PRACTICAL TIPS

- One of the largest gaps in knowledge may be the implicit knowledge of private actors and true location of economic and social activities at sea. Registered addresses of firms are often insufficient for example for the analysis of human impact on the sea.
- Instruments for marine spatial data acquisition (Vetter et al. 2012): satellites, aircraft, vessels, buoys, moorings, water samplers, sediment samplers, in situ microprofilers, mobile underwater platforms, submarines, divers and physical maps.
- Utilise participatory GIS exercises (PGIS) e.g. for locating activities that do not leave a mark in official datasets (such as fishing areas, tourist destinations) and interests on sea space. Many applications exist for collecting digital spatial data from participants either in workshops, in the field or online.
- For example, "expert mapping" on canvas maps can be used in events (workshops, stakeholder meetings) to create spatial data of the views of MSP experts or marine sector experts. Sea uses and planning ideas can be marked on the map by drawing or settings pins or board game pieces on the map (see Figure 2 for some ideas). The resulting plan can be photographed and digitised into digital spatial data. In the Plan4Blue case study, the drawings were interpreted into either point, line or polygon map items, digitised as three spatial layers, separately for the four main blue economy sectors dealt with in the project (maritime cluster, blue bioeconomy and subsea resources, energy, tourism). General distributions of the expert views and conflicts and compatibilities between the four sectors were analysed.

STEP 8. MANAGE SPATIAL DATA

In this step, the input data for spatial analyses and distribution are managed to ensure easy access to it and to store the harmonised versions of the data. The metadata catalogue is updated according to the changes made in this step.

VAIHE 8. PAIKKATIETOAINEISTOJEN VIIMEISTELY
Analyyseissä ja visualisoinnissa käytettävät harmonisoidut aineistot järjestetään niin, että niiden hallinta työskentelyn aikana on mahdollisimman sujuvaa ja tehokasta. Vaiheessa 8 tehdyt muutokset päivitetään metatietoluetteloon (5.1).

ETAPP 8. RUUMIANDMETE VIIMISTLUS
Analüüsimisel ja visualiseerimisel kasutatavad ühtlustatud materjalid on järjestatud nii, et nende haldamine töö käigus on võimalikult sujuv ja tõhus. Etapis 8 tehtud muudatused uuendatakse metaandmete kataloogi (5.1).

8.1 MANAGE FILE NAMES

8.1 YHDENMUKAISTA AINEISTOJEN NIMEÄMINEN

8.1 ÜHTLUSTA FAILIDE NIMED

Create a clear naming system for spatial data files and explain it in the metadata catalogue. The file name should be concise but specify the origin, resolution and version of the data.

PRACTICAL TIPS

- Renaming of pre-existing spatial data files is only necessary when redistributing it e.g. via MSP spatial data portals.
- Write descriptions on the file naming system and document new file names in the metadata catalogue.

8.2 CHECK METADATA

8.2 TARKISTA METATIEDOT

8.2 KONTROLLI METAANDMED

Before analyses, visualisation and publication of the results, double-check the metadata catalogue. Check that detailed metadata exists for original datasets created in the MSP process, as well as for heavily edited datasets that will be publicly redistributed, and that all potential changes have been documented.

PRACTICAL TIPS

- When possible, follow the INSPIRE standard (INSPIRE Maintenance and Implementation Group 2017; for an INSPIRE metadata editor see page http://inspire-geoportal.ec.europa.eu/editor/).

8.3 STORE DATA AND DOCUMENTATION

8.3 TALLENNA AINEISTOT JA DOKUMENTOINTI

8.3 SALVESTA ANDMED JA DOKUMENTATSIOON

Store spatial data files, the metadata catalogue and the guidance document. Store all original information both on hard drives and cloud services. Document all the issues relevant for finding and using the spatial data into the guidance document.

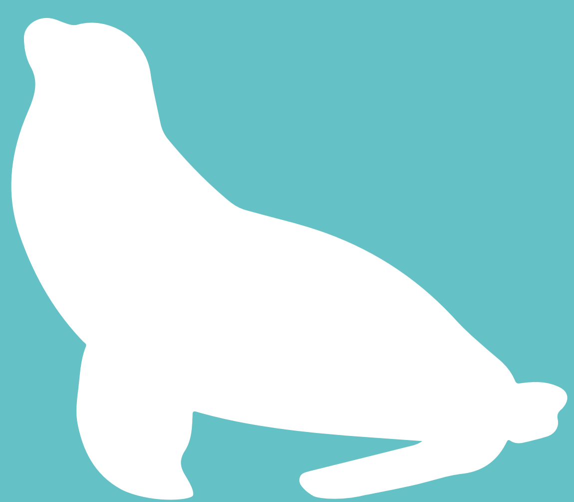
PRACTICAL TIPS

- Use database software to organise the data or work out a systematic structure for organising them on hard drives and cloud services.
- Keep copies of existing spatial layers, derived layers and original layers (created in the MSP process) separate.
- Keep your data archive up to date frequently, preferably using an automatic backup system.

III. ANALYSE SPATIAL DATA – EXAMINE INTERACTIONS

In the third phase, methods in geoinformatics are applied to model new data, analyse spatial interactions of activities and interests in sea space, and to transform analysis outputs into meaningful results for MSP. In the marine environment, temporal dynamics and three-dimensional patterns may need to be analysed in addition to the static two-dimensional interactions. At sea, processes often operate at an international level, making it mandatory to extend the analyses from the plan area into larger geographical areas and across boundaries.

The analyses are guided by the guidance document (4.3). The majority of the principles described in this section of the guide apply both inside and across administrative and sectoral boundaries, but cross-border evaluation and harmonisation of input data (previous phases) are crucial for the validity of the analysis results.



III. PAIKKATIETO-ANALYYSIT – VUOROVAIKUTUSTEN TUTKIMINEN

Kolmannessa osiossa tutkitaan meriympäristön ja ihmistoiminnan spatiaalisia vuorovaikutuksia paikkatietomallinnuksen avulla. Osion tavoite on tuottaa tietoa, joka on tarkoituksenmukaista käynnissä olevan suunnitteluprosessin kannalta. Meriympäristön paikkatietoanalyyseissa korostuvat kolmiulotteinen geometria ja ajallinen muutos. Lisäksi merialuesuunnittelussa toimitaan usein kansainvälisellä tasolla, minkä vuoksi analyysit usein ulottuvat varsinaisen suunnittelualueen ympäristöön.

Tämän osion paikkatietoanalyysien valintaa ja toteuttamista säätelevät ohjaavan dokumentin (4.3) yhdessä sovitut periaatteet, jotka pätevät pääsääntöisesti rajat ylittävässä työskentelyssä. Lähtöaineistojen harmonisoinnin onnistuminen ratkaisee koko analyysiketjun toimivuuden, joten siihen on kiinnitettävä erityistä huomiota.

III. RUUMIANDMETE ANALÜÜS – VASTASTIKUSTE MÕJUDE UURIMINE

Kolmandas osas vaadeldakse ruumilise modelleerimise kaudu merekeskkonna ja inimtegevuse vahelisi ruumilisi koostoimeid. Kolmanda osa eesmärk on esitada käimasoleva planeerimisprotsessi seisukohalt olulist teavet. Merekeskkonna ruumiandmete analüüsis rõhutatakse kolmemõõtmelist geomeetriat ja ajalist muutust. Lisaks viiakse mereala ruumiline planeerimine sageli läbi rahvusvahelisel tasandil, mis viib tihti tegeliku kavandamispiirkonna keskkonna analüüsini.Analüüsid lähtuvad suunisdokumendist (4.3). Enamik käsiraamatu käesolevas peatükis kirjeldatud põhimõtetest kehtivad nii haldus- kui ka sektoripiiride sees ja üle selle, kuid sisendandmete (eelmised etapid) piiriülene hindamine ja ühtlustamine on analüüsi tulemuste kehtivuse seisukohast otsustava tähtsusega.

Ruumiandmete analüüsi valimist ja rakendamist reguleerivad selles osas põhimõtted, mis on piiriülese töö puhul üldiselt kokku lepitud suunisdokumendis (4.3) Algmaterjali ühtlustamise edu mõjutab kogu analüüseahela funktsionaalsust, mistõttu tuleb sellele erilist tähelepanu pöörata.

STEP 9. PLAN SPATIAL ANALYSES

This step aims at ensuring that spatial analyses are guided by the goals of MSP and specific objectives, outlined in the guidance document (4.3). Efficiency of the process is increased by clarifying the workflows and roles of GIS specialists and other actors in MSP.

VAIHE 9. PAIKKATIETOANALYYSIEN SUUNNITTELU
Vaiheessa 9 varmistutaan siitä, että tehtävät analyysit ovat merialuesuunnittelun yleisten ja ohjaavassa dokumentissa (4.3) kuvattujen tapauskohtaisten tavoitteiden kannalta tarkoituksenmukaisia. Prosessin tehokkuutta lisää jos paikkatietoasiantuntijoiden ja muiden toimijoiden välinen työnjako analyysivaiheessa tehdään selväksi kaikille osapuolille.

ETAPP 9. RUUMIANALÜÜSI PLANEERIMINE
Etapis 9 püütakse tagada, et teostatavad analüüsid on asjakohased mereala ruumilise planeerimise konkreetsetele juhtumipõhistele eesmärkidele ja on kirjeldatud suunisdokumendis (4.3). Protsessi tõhusust suurendatakse, kui analüüsietapi jooksul selgitatakse kõigile osapooltele GIS-spetsialistide ja teiste osalejate vahelist tööjaotust.

9.1 IDENTIFY INTERACTION TYPES

9.1 TUNNISTA VUOROVAIKUTUSTEN TYYPIT

9.1 TUVASTA VASTASTIKUSTE MÕJUDE TÜÜBID

Prepare for spatial analysis by setting detailed analysis goals, following the guidance document and in collaboration with subject experts. Identify the considered interacting marine activities or interests based on the needs of the planning process (Figure 3).

Interactions can be classified into use-use (between human activities) and use-ecosystem (between human activities and nature values) interactions. These two types of interactions have some fundamental differences that influence analysis, inference and terminology. According to the ecosystem-based approach of MSP, the conditions of marine ecosystems should be taken in to account when planning human activities.

Identify the types of interaction: e.g. conflict, synergy and neutral coexistence. In addition, caution zones can be identified around human activities and important areas for preserving ecosystem services.

PRACTICAL TIPS

- Interaction matrices are a practical tool for outlining the interactions between multiple environmental aspects and human activities.

9.2 STREAMLINE WORKFLOWS

9.2 TEE TYÖNKULKU MAHDOLLISIMMAN SUJUVAKSI

9.2 TEE TÖÖPROTSESSID VÕIMALIKULT SUJUVAKS

Prepare for spatial analysis by considering the entire workflow from data to requested maps. Use a purpose-oriented instead of data-oriented approach to plan the workflow (Figure 3).At the latest at this stage, the roles of those stakeholders that participate in the map production process should be clarified to divide work and responsibility for spatial analyses. In an ideal situation, the stakeholders and those who prepare and produce spatial data have been assigned before the map production process starts.

Use uniform data, analyses and visualisation whenever possible. Consequently, the results will be as comparable, informative and easy to evaluate as possible.

PRACTICAL TIPS

- See a review of Suominen et al. (2018) for details of designing analysis workflows in MSP.

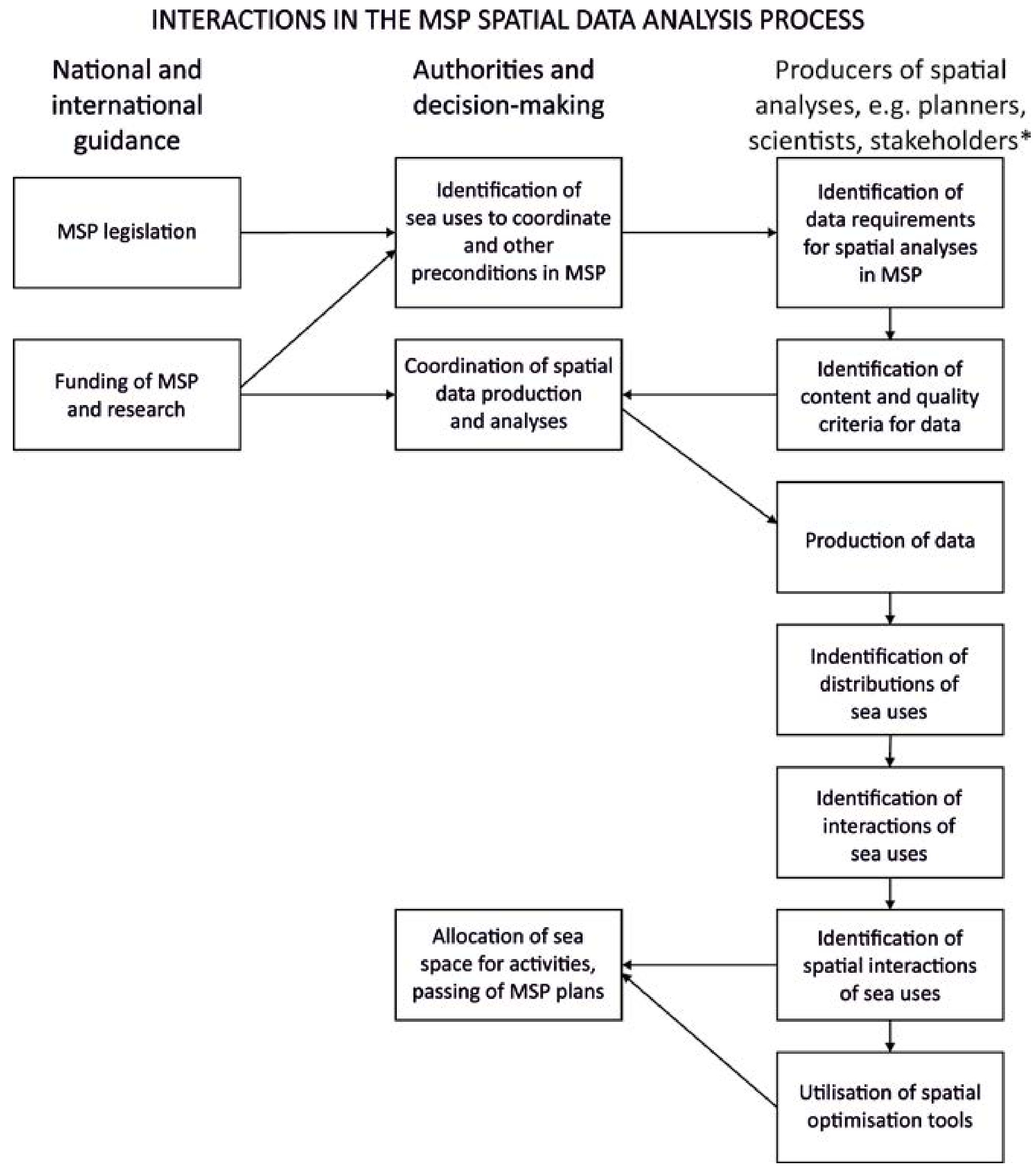
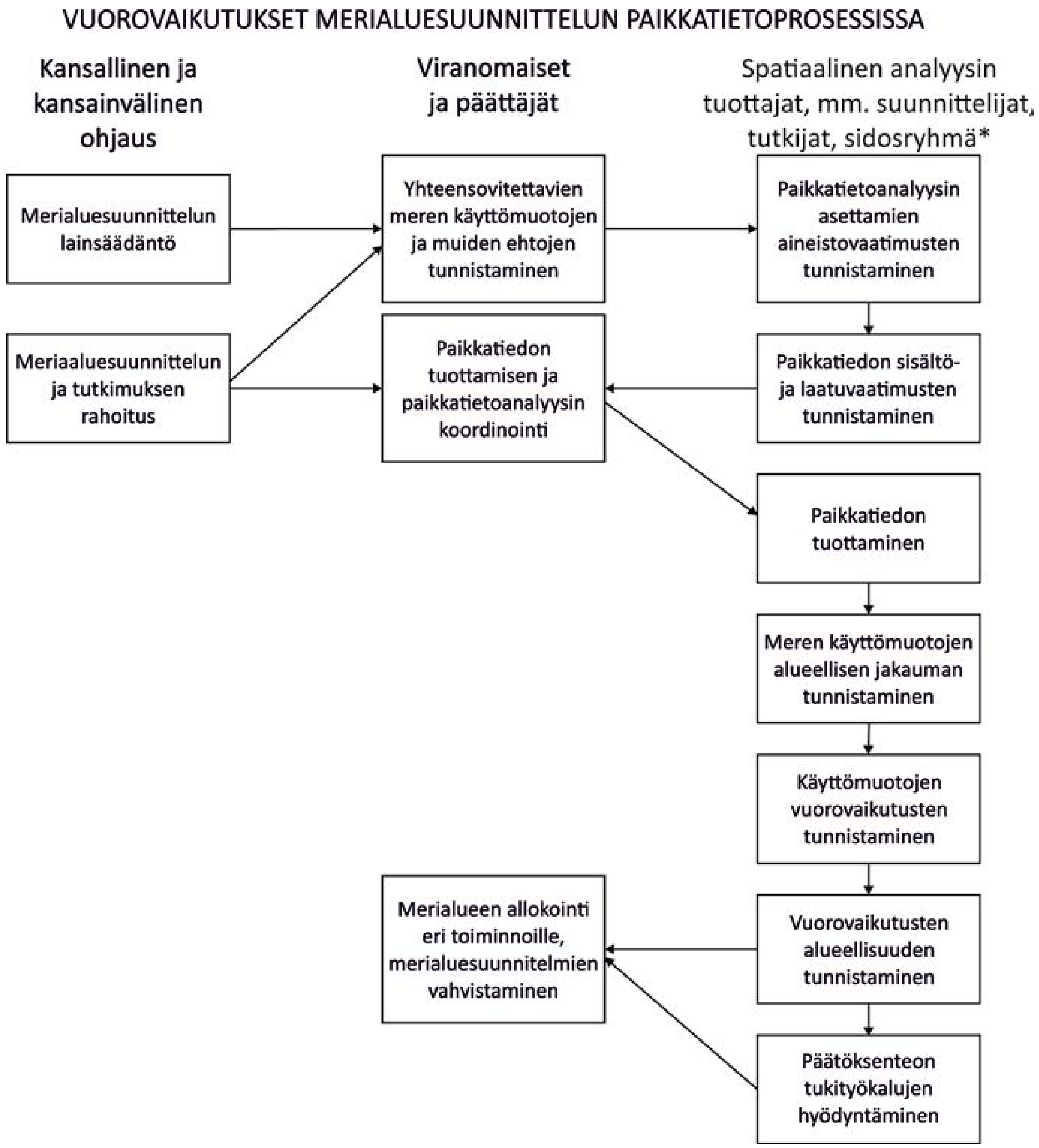
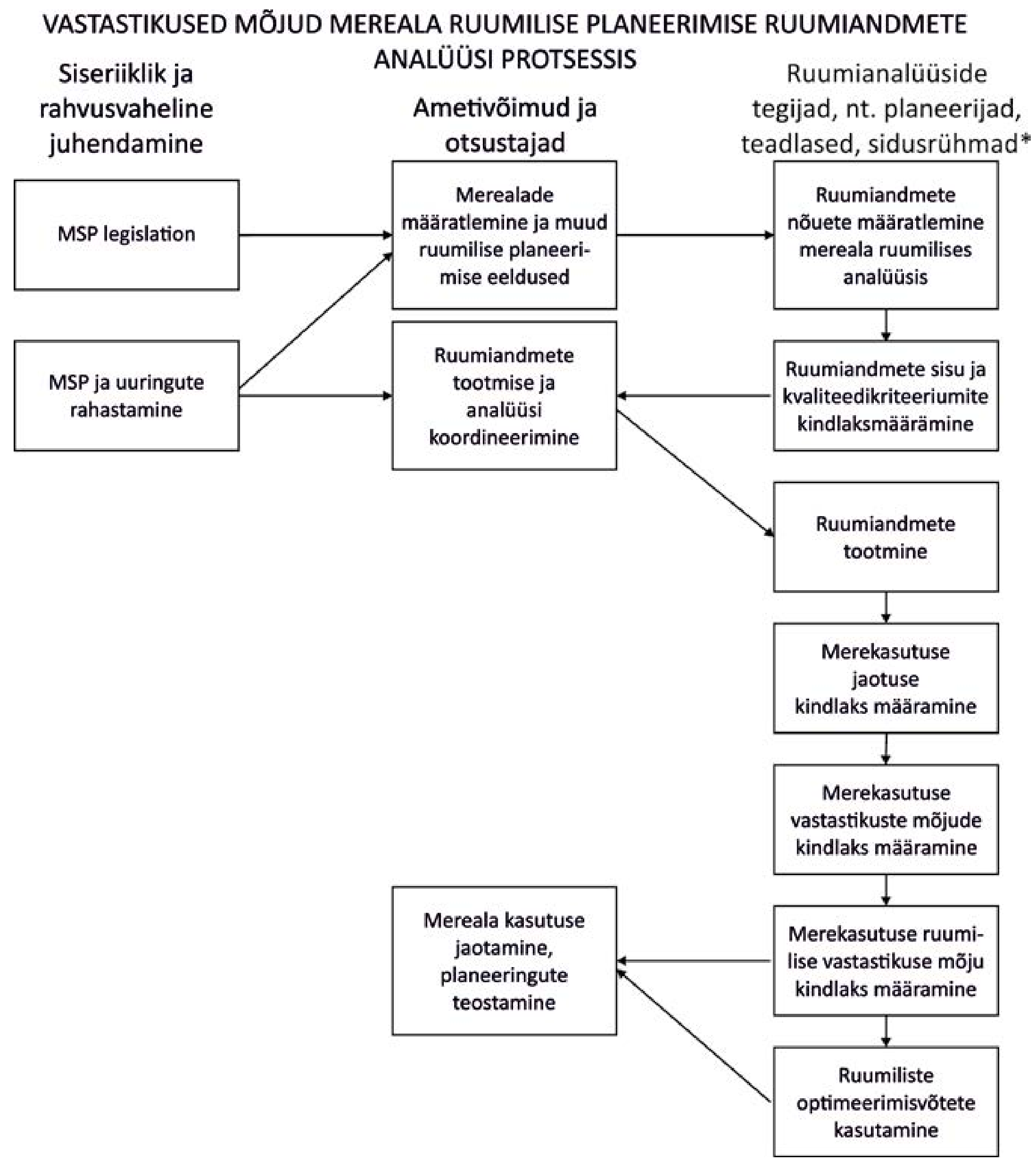


Figure 3. An example of a workflow for analysing spatial interactions of sea uses and the roles of different actors in the MSP spatial data analysis process (modified from Suominen et al. 2018). *In an ideal situation, the stakeholders and those who prepare and produce spatial data have been assigned before the map production process starts.



Kuva 3. Esimerkki merialuesuunnittelun spatiaalisen vuorovaikutusanalyysin työnkulusta, joka osoittaa eri toimijoiden roolit prosessin aikana (Suomisen ym. 2018 mukaan). *Ideaalissa tilanteessa sidosryhmä ja paikkatietoprosessiin osallistuvat on nimetty ennen prosessin alkua.



Joonis 3. Näide ruumilise interaktsiooni analüüsi tööprotsessist, mis esitab erinevate osalejate rolli protsessis (vastavalt Suominen et al. 2018).

STEP 10. ANALYSE SPATIAL DATA AND INTERACTIONS

This step consists of the application of spatial analysis to examine interactions of human activities at sea with each other and with the environment.

Different spatial analysis methods are needed to examine each interaction and to handle different data types. Accordingly, whereas the other steps are described in this guide in chronological order, the subsections (10.A-10.K) of Step 10 introduce a selection of commonly used alternatives for spatial analyses, each with different prerequisites and purpose.

Note that the exact procedures and names of the tools differ between GIS software: they are described very generally in this guide. This guide merely offers useful keywords for searching software-specific instructions.

VAIHE 10. ALUEELLISTEN VUOROVAIKUTUSTEN TUTKIMINEN

Vaiheessa 10 sovelletaan erilaisia geoinformatiikan menetelmiä, joilla tarkastellaan merialueella tapahtuvien toimintojen välistä vuorovaikutusta sekä näiden vuorovaikutusta luonnonympäristön kanssa.

Eri ilmiöitä kuvaavia aineistotyyppejä on useita, ja näiden vuorovaikutusten tutkimukseen sovelletaan erilaisia menetelmiä. Siksi tämän vaiheen toimenpiteitä ei jäsennellä numeroidusti kronologisessa järjestyksessä, vaan keskenään rinnasteisina (10.A-10.K). Tämän vaiheen sisällöksi valitut yksitoista paikkatietomenetelmää ovat yleisesti käytettyjä perusmenetelmiä, joilla vastataan eri alueellisen vuorovaikutuksen kysymyksiin.

ETAPP 10. RUUMIANDMETE JA NENDE VASTASTIKUSTE MÕJUDE UURIMINE

10. etapis rakendatakse erinevaid geoinformaatika meetodeid, et uurida merel toimuvate tegevuste omavahelist mõju ja omakorda vastastikust mõju looduskeskkonnale.

Erinevaid nähtusi kirjeldavaid andmeid on mitut tüüpi ja nende interaktsioonide uurimiseks kasutatakse erinevaid meetodeid. Seetõttu ei ole see etapp struktureeritud kronoloogilises järjekorras, vaid paralleelselt (10.A-10.K). Selle etapi sisu jaoks on valitud üksteist ruumiandmete põhimeetodit, mida kasutatakse tavapäraselt erinevatele piirkondlike vastastikuste mõjude uurimiseks.

III. ANALYSE SPATIAL DATA – EXAMINE INTERACTIONS

10.A GROUPING AND RECLASSIFYING SPATIAL DATA

10.A PAIKKATIETOAINEISTOJEN RYHMITTELY JA UUDELLEENLUOKITTELU

10.A RUUMIANDMETE RÜHMITAMINE JA ÜMBERKLASSIFITSEERIMINE

Open data and results of surveys and PGIS processes can be summarized and simplified to produce more useful classifications for MSP. This is a highly subjective process and should be done in communication with subject experts.

- Input data requirements: Vector or raster data.
- In practice: With raster layers, this is done by reclassifying cell values (using reclassify tool). With vector layers, map items (points, lines or polygons) are selected (manually or using query / select by attributes tool) and given new attribute information that determines inclusion in new classes. Optionally, existing attribute information or item geometry is used for calculating the new attribute values based on criteria (calculate field / calculate geometry tool).
- Example: Locations where an activity is expected to claim new area or increase in volume may be grouped if there is a limited amount of data or separate classes ultimately represent the same phenomenon.
- Example: A raster layer, such as commercial fisheries catches or modelling results for the occurrence probability of Zostera marina, can be simplified by classifying the cell values e.g. into high, medium and low.

10.B COMBINING INFORMATION INTO AGGREGATE LAYERS

10.B TIETOJEN YHDISTÄMINEN UUSIKSI KARTTAKERROKSIKSI

10.B INFORMATSIOONI ÜHENDAMINE UUTEKS KAARDIKIHTIDEKS

In MSP, the high number of aspects to be considered simultaneously is a challenge and thus simplification of input data are appealing. Aggregate spatial data combine information from multiple sources into a simple quantification. They are a single map layer that has been calculated by summarising multiple input layers based on predefined criteria. The single map layer is easier to incorporate into decision-making than dozens of layers. It must be emphasised that the quality of input data and the criteria for summarising them are crucial for the usability of the aggregate data and need to be clearly reported.

- Input data requirements: Vector or raster data.
- In practice: Input spatial datasets are processed into harmonious layers (e.g. point observations to surfaces with correlative spatial modelling) and potentially weighed (e.g. with raster algebra based on other data. The (weighed) layers are then combined into one new layer based on mathematical or logical criteria.
- Example: Multiple ecosystem components, such as the distribution and richness of seabed flora and fauna, water birds and seals, can be combined into one spatial data layer that aims at describing the distribution of key nature values. In addition, each component can

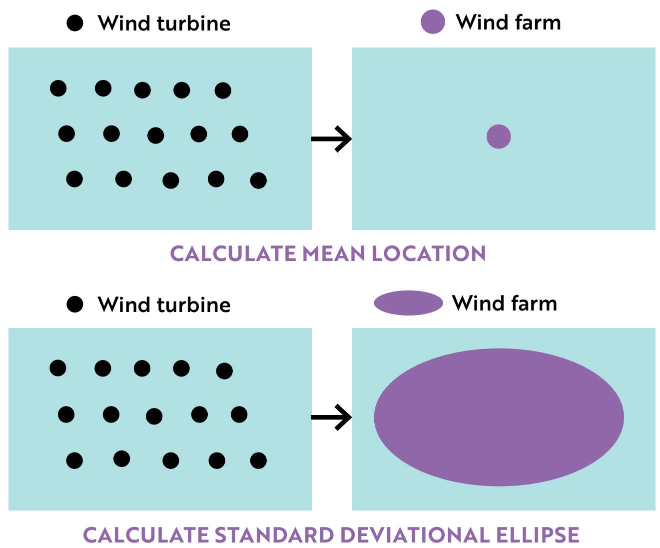


Figure 4. An illustration of calculating the mean location of points (above) and standard deviational ellipse (below) to summarize a point distribution.

be weighted using an estimate of its sensitivity to human disturbance and then combined into "environmental vulnerability profile" (Aps et al. 2018). Finally, the vulnerability profile can be weighted with information on the distribution of cumulative human pressures to produce an "environmental risk profile" (Aps et al. 2018). It describes the spatial distribution of the likelihood to damage nature values.

10.C SIMPLIFYING VECTOR DATA

10.C VEKTORIAINEISTOJEN YKSINKERTAISTAMINEN

10.C VEKTORANDMETE LIHTSUSTAMINE

Geographic distributions of map items (points, lines and polygons) can be summarized or simplified for creating new data, for visualisation purposes or for comparing distributions. Mainly, the analyses replace multiple map items with one item (e.g. points to point or points to polygon) that represents the entire group of items.

- Input data requirements: Vector data.
- In practice: Centrographic statistics or computational geometry methods are used for determining a central location and, potentially, the distribution or directional trend of a vector layer.
- Example: A group of point locations (e.g. of individual offshore wind turbines) can be replaced by one point that represents the mean location of the group (e.g. location of the offshore wind farm; Figure 4).
- Example: The directional distribution tool can be applied to mathematically summarize point distributions into polygon features (e.g. Roose et al. 2017). The individual offshore wind turbine locations can be transformed into one polygon representing the wind farm (Figure 4).
- Example: The distributions of two phenomena can be summarised into central locations and thus more easily compared. Similarly, the distribution of the same phenomenon measured at different times can be more easily compared by calculating central locations for the distributions.
- Example: Cluster and outlier analysis based on spatial autocorrelation (Anselin Local Moran's statistic) examines the attributes of point or polygon layers to create a map of statistically significant hot spots, cold spots and spatial outliers. Instead of simplifying the input data layer into fewer map items, it identifies those input map items that are part of a hot (cluster of high values) or cold spot (cluster of low values) or those that are outliers.

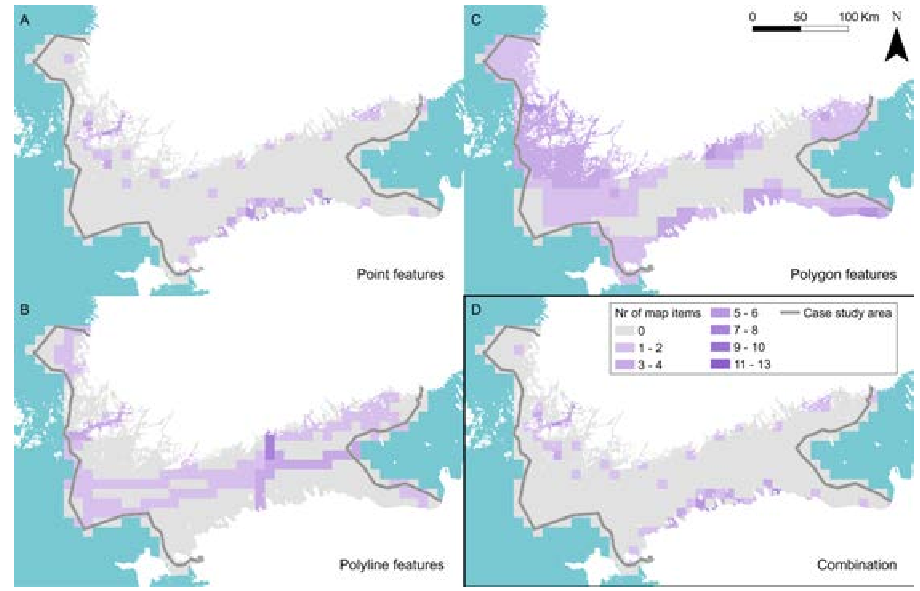


Figure 5. Visualization of expert mapping data as intensity surfaces using a regular sampling grid. The distribution of point, polyline and polygon map items are shown separately in subfigures A-C and combined in subfigure D. When examining subfigure D, note that the three map item types (subfigures A-C) cannot be directly compared due to their topological differences.

10.D ANALYSING SPATIAL DISTRIBUTIONS AS SURFACES

10.D ALUEELLISTEN JAKAUMIEN ANALYSOINTI PINTOINA

10.D RUUMILISE JAOTUSE ANALÜÜSIMINE PINDADENA

Spatial patterns of locations (or values related to each location) can be mathematically simplified and characterised as continuous surfaces. The analysis generalises information from a set of vector items to a larger area and transforms vector data into raster data. This can be used for visualisation purposes.

- Input data requirements: Vector data.
- In practice: Surfaces can be calculated from vector data for example with density analysis tools (calculating the number of map items per certain spatial unit) and hot spot analysis tools (locating clusters of high and low values).
- Example: Features can be summarized into regular grids (e.g. number of point features per square kilometre or number of line features running through each grid cell). Point, line and polygon features should be summarized separately to appreciate their different topological characteristics (Figure 5).
- Example: Heat maps can be calculated to visualise and analyse the distribution of e.g. biological survey data or public PGIS data.

10.E ANALYSING DISTANCES (NEIGHBOURHOOD ANALYSIS)

10.E ETÄISYYKSIEN ANALYSOINTI (NAAPURUUSANALYYSIT)

10.E VAHEMAADE ANALÜÜS (NAABRUSANALÜÜS)

Neighbourhood analysis (also called buffer analysis) can be used to calculate "caution zones" around locations of activities or plans. In addition, neighbourhood analysis can be used to weight the influence of activities based on their distance. Typically, the closer the activity, the higher its influence.

- Input data requirements: Vector data.
- In practice: Multiple ring buffer tool and inverse distance weighting (calculate field tool) can be used to calculate weights for distance zones.
- Example: Caution areas with certain radii may be considered around offshore wind energy constructions or deep water navigation areas (potentially depending on the other considered activity).
- Example: The influence of marine traffic (waves, noise etc.) from different locations on the surrounding nature can be weighted by determining distance zones around conservation areas. To consider the entire network of conservation areas, the distance zones can be calculated separately for each conservation area and summed to create a cumulative distance surface.

10.F DETERMINING CO-LOCATION (OVERLAY ANALYSIS)

10.F ALUEELLISTEN PÄÄLLEKKÄISYYKSIEN ANALYSOINTI (PÄÄLLEKKÄISANALYYSIT)

10.F KAASASUKOHA ANALÜÜS (ÜLEKATTE ANALÜÜS)

To analyse the spatial interactions of activities, overlay analysis can be applied. It allows the determination of areas where activities (or their influence zones) or ecosystem values (or their caution zones) do and where they don't overlap. These can be further interpreted into "no conflict" and "conflict" areas or "no synergy" and "synergy" areas depending on the interaction. The analyses need to be adapted to the data structure or the data to be transformed.

- Input data requirements: Vector or raster data.
- In practice: In the simplest case, two polygon layers are compared with vector overlay methodology (e.g. calculating the union of the two layers). In raster overlay, raster algebra (raster calculator tool) can be used to calculate different combinations of two raster layers.
- Example: The potential conflicts between an established nature conservation network and shipping can be quantified and located with overlay analysis. First, shipping density can be classified into "traffic" and "no traffic" and transformed into polygon data. Second, the union of conservation area polygons and traffic polygons can be calculated and reclassified into conflict/no conflict area.
- Example: "Caution areas" for biodiversity hotspots (where human activities would be too close without overlapping) can be analysed by first determining "caution zones" around the hotspots (neighbourhood analysis) and then performing the overlay analysis.

10.G CALCULATING INFLUENCE AREA AND CAUTION AREA

10.G VAIKUTUS- JA VAROALUEIDEN LASKEMINEN (PUSKUROINTI)

10.G MÕJUALA JA HOIATUSALA ARVUTAMINE

The influence area of an activity or the caution area of an environmental distribution is as important as the location of the activity or environmental values. The determination of these areas is complicated and case-specific and requires a notable amount of expertise and data. Influence and caution areas are often roughly estimated by calculating buffer zones (neighbourhood analysis). Depending on the case however, the size, shape, vertical dimensions and temporal patterns of the influence and caution areas may differ notably from simple buffer zones.

- Input data requirements: Vector or raster data.
- In practice: The selection of the analysis method is highly case-dependent. Visibility analysis methodology can be applied for estimating the influence area of those marine activities whose influence spreads easily along the sea surface but is delimited by coastline. Calculation of an isarithm (line connecting points of equal values) can be used to determine an influence area based on survey points.
- Example: A visibility analysis framework can be applied to calculate rough estimates of the propagation of light, sound and waves (Figure 6) from sources to targets. Alternatively, the analysis can be used for mapping potential source areas for specified targets. This may be useful in e.g. archipelagos were islands complicate propagation. However, visibility analysis is unable to account for reflection and refraction processes. The visibility area can be weighted based on distance to targets by applying neighbourhood analysis (10.E; Figure 6).
- The influence area of a river that acts as a point source of nutrients into the sea may be estimated from point observations of nutrient content in sea water by statistically determining a threshold level of nutrient content and calculating an isarithm for the threshold value.

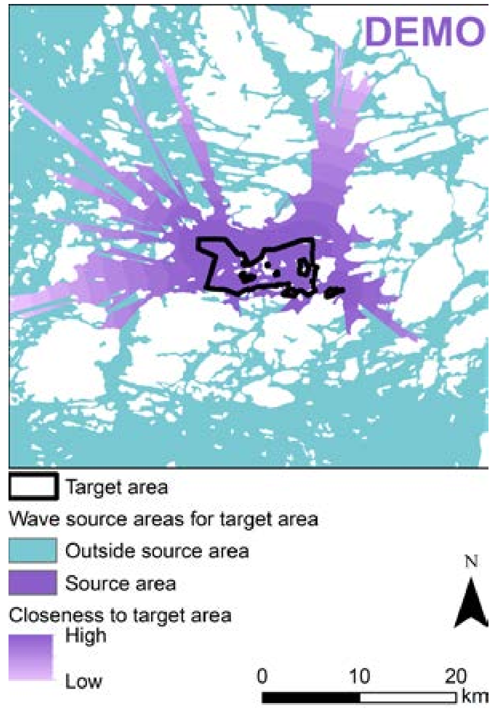


Figure 6. Illustration of simple estimation of wave source area for a single target area using visibility analysis methodology. Shipping (in addition to other wave-inducing activities and wind) in the wave source area is expected to cause waves and other disturbance in the target area. The influence of shipping in the visible area is expected to decrease with distance to the target. The analysis does not account for wave refraction caused by bathymetry and shoreline geometry.

10.H IDENTIFYING TEMPORAL VARIATION AND TRENDS

10.H AJALLISTEN VAIHTELUIDEN JA TRENDIEN TUTKIMINEN

10.H AJUTISE VARIATSIOONI JA TRENDIDE UURIMINE

Temporal variation and trends may be relevant for MSP in many cases. They may prevent or allow co-locating activities, make the analysis of ecological implications more complex or require changing the control of sea use in the future. GIS methodology supports information of time in addition to location and attributes. Therefore, time can be treated, visualised and examined correctly.

- Input data requirements: (Mainly) vector data.
- In practice: Time can be stored into the attribute data of map items and assigned as a temporal attribute field. There are multiple choices for visualising temporal data, depending on the type of the case.
- Example: Points indicating sightings of a marine

species can be coloured depending on the year, month or date of the sighting. This may be useful for visualising seasonal movement or year-to-year increase of the species or quality of the data.

- Example: Map items with different timestamps can be visualised as a set of maps or as animations (items appearing and disappearing from the map according to the time stamp) to examine past trends.
- Example: Point data of ship routes or GPS-tracked animal routes can be visualised by creating routes.
- Example: To analyse temporal trends, the distribution of the map items can be summarized individually for each time slot and compared (e.g. the shifting of the centre of the distribution from season to season or year to year).

10.I ANALYSING CAUSE AND EFFECT

10.I SYY-SEURAUSSUHTEIDEN ANALYSOINTI

10.I PÕHJUSTE JA TAGAJÄRGEDE ANALÜÜSIMINE

Spatial data contain useful attribute information that can be statistically analysed to examine potential causal relationships. Statistical models estimate the relation-ships of variables with mathematical equations and enable the evaluation of the importance of the relationship. The models can be further utilised to predict values into other areas (7.2) or to future conditions (10.J). With spatial data, the spatial structure of the data needs to be taken into account, since it may violate the assumptions of standard statistical methods.

- Input data requirements: Vector or raster data. Observations of multiple variables (attributes/cell values) for the same locations to form a coherent dataset.
- In practice: The spatial structure of the data needs to be taken into account, since for example spatial autocorrelation violates against the assumption of independence of the observations. This is done by applying modelling methods specifically designed for spatial data (e.g. spatial regression) or examining spatial autocorrelation and when it is insignificant, proceeding with non-spatial statistical methods. Statistical modelling methods can be broadly classified into regression models and machine learning models and spatial and non-spatial models, each with different preconditions and advantages. Moreover, the modelling can be classified into predictive modelling (with the purpose to efficiently predict values outside the sample; see 7.2) and hypothesis testing (with the purpose to drive reliable conclusions on causal relationships), which influences the validation of the models.
- Example: Hypothesis testing can be applied for analysing the potential dependency of water quality on shipping density and other factors. For example, two multiple linear regression models can be fitted into point observations of water quality and biophysical data: one model excluding and the other including shipping density. The predictive power of the two models can be statistically compared to examine the independent influence of shipping on water quality.

10.J PROJECTING FUTURE DISTRIBUTIONS

10.J ALUEELLISTEN MUUTOSTEN PROJISOINTI TULEVAISUUTEEN

10.J PIIRKONDLIKE MUUTUSTE TULEVIKUPROJEKTSIOON

Future distributions and patterns can be estimated based on past trends, future scenarios and correlative modelling (e.g. "climate envelope modelling"; 7.2). MSP should prioritise modelling results that are based on scientific research and reported following scientific principles.

- Input data requirements: High-resolution vector or raster layers of current and/or future conditions. Non-spatial trend estimates or a statistical model (10.I).
- Example: The simplest type of a spatial future projection is using a quantitative but non-spatial estimate of future change and applying the uniform estimate for calculating new values. For example, if shipping in the Gulf of Finland is estimated to grow by 15 % from 2018 to 2030, then all cell values of a raster layer of shipping densities in 2018 are multiplied by 1.15. The new layer will then represent current-day patterns and future level of the phenomenon.

- Example: A statistical model for the dependence of water quality on shipping and biophysical factors (see example in 10.I) can be used for estimating water quality in the future assuming certain changes in shipping density. If biophysical factors as assumed to be constant, shipping density is replaced by new values in the equation and new water quality values are calculated.

10.K ANALYSING THREE-DIMENSIONAL PATTERNS

10.K KOLMIULOTTEINEN ANALYSOINTI

10.K KOLMEMÕÕTMELINE ANALÜÜS

The vertical dimension may be more important in MSP than in land-use planning. Depth may influence the interaction of specific activities and the allocation of sea space for activities. Many activities interact at the surface of the sea: for example, cargo shipping and leisure boating compete for the use of sea surface space and ship-induced waves travel the shallow surface layer influencing littoral species. However, cables and other constructions at the bottom of the sea may only limit the use of the sea surface in very shallow areas while for example cables and fish farms may coexist on top of each other in many areas.

- Input data requirements: Three-dimensional vector data, surface data or 2D vector data in combination with surface data
- In practice: Depending on the type of analysis and the activities considered for MSP, it may be useful to work with three-dimensional data and methods. In GIS, even two-dimensional data can be incorporated into three-dimensional analyses and visualizations: their z-coordinates will simply be assumed to be zero. However, three-dimensional data are more difficult to create and edit than two-dimensional data, and it is therefore not advisable to add the third dimension to all data. Depth (or height) can be added to two-dimensional data from existing surfaces.
- Example: To examine co-location issues in multi-use areas, three-dimensional data of offshore wind farms, cables and key natural habitats can be visualised with three-dimensional extensions of GIS software. They also enable the construction of animations.
- Example: A two-dimensional line representing the location of a pipeline at the bottom of the sea can be visualised in a three-dimensional space by using an existing bathymetric model of the seafloor.

STEP 11. TRANSFORM SPATIAL ANALYSIS OUTPUTS INTO MEANINGFUL RESULTS FOR MSP

This step facilitates the work of planners, authorities and stakeholders by transforming the outputs of spatial analyses into meaningful results for MSP.

VAIHE 11. TULOSTEN MUOKKAAMINEN SUUNNITTELUPROSESSIN KANNALTA TARKOITUKSENMUKAISIKSI
Paikkatietoanalyysien tulokset muokataan suunnitteluprosessin kannalta tarpeelliseen ja käyttökelpoiseen muotoon.

ETAPP 11. TULEMUSTE MUUTMINE PLANEERIMISE JAOKS TÄHENDUSLIKEKS JÄRELDUSTEKS
See samm hõlbustab planeerijate, ametiasutuste ja sidusrühmade tööd, muutes ruumianalüüside tulemused mereala ruumilise planeerimise jaoks oluliseks.

11.1 DETERMINE CRITERIA AND TERMINOLOGY FOR MEANINGFUL RESULT LAYERS

11.1 MÄÄRITTELE ALUEELLISTEN VAIKUTUSTEN KRITEERIT JA TERMIT

11.1 MÄÄRA KINDLAKS RUUMILISE MÕJU KRITEERIUMID JA TERMINOLOOGIA

Determine criteria and terminology for interpreting the "raw" analysis outputs from Step 10 into meaningful results for MSP. Spatial analyses at Step 10 produce output data layers with a wide range of numerical scales. Often, the "raw" analysis results are difficult to interpret and compare to other results, at least without a deeper knowledge of each maritime sector and the spatial analysis methodology. The work of planners, authorities and stakeholders across sectoral borders is facilitated by transforming the output layers into meaningful results for MSP.

In the simplest case, this is done by (re)classifying the values of the result layers and (re)naming the classes in a meaningful way.

PRACTICAL TIPS

- Find out what the expected format of the output information is. For example, one choice would be to extract the output information as one raster layer, with values indicating the potential impact for MSP at each cell location.
- Find out what would be a suitable classification for the output information and if there is a predefined terminology for the classes. If all analysed interactions have similar preconditions and potential impact for MSP, a uniform classification scheme should be applied to facilitate examination and comparison of the results. For example, a possible classification for the analysis results of the interaction between shipping and nature conservation could be: "No conflicts" (areas where shipping does not disturb nature conservation areas based on an analysis), "Increased shipping not recommended" (areas were shipping might disturb nature conservation but where there is no significant traffic at the moment) and "Shipping requires special attention" (areas with heavy traffic and where shipping causes disturbance in a nature conservation area based on an analysis).
- The number of the classes (different types of potential impact for MSP) influences the precision of the output information and the strength of the message. The classification should be designed individually for each analysis, since the analyses have different preconditions and potential impact for MSP. The less classes, the stronger the message (and the stronger the influence of the analyst on the interpretation). However, the analysed interaction may in some complex cases require a higher number of classes to adequately describe the complexity.

11.2 PREPARE NEW MEANINGFUL MAP LAYERS

11.2 LAADI KARTTAKERROKSET ALUEELLISISTA VAIKUTUKSISTA

11.2 KOOSTA UUSI TÄHENDUSLIKKE KAARDIKIHTE

Use existing spatial data, outputs of the analyses of spatial interactions (Step 10) and expert opinions to derive meaningful spatial results for MSP.

In case multiple scenarios have been developed and analysed in Step 10, there will be multiple alternative outcomes.

PRACTICAL TIPS

- For example, reclassify a raster layer of negative interactions into 1) no interaction, 2) potential or weak interaction and 3) probable or strong interaction and give the classes the appropriate names. In another case, reclassify "union" features into 1) conflict (overlap of activities), 2) caution (overlap of activity and the caution zone of another activity) and 3) no interaction areas.

11.3 APPLY DECISION SUPPORT TOOLS

11.3 SOVELLA PÄÄTÖKSENTEON TUKITYÖKALUJA

11.3 RAKENDA OTSUSTE TEGEMISEKS TUGIVAHENDEID

Explore different ways of using sea space in an objective way, using decision support tools. This is only relevant when MSP allows the rearrangement of multiple activities or allocation of sea space in a new way (instead of simply documenting current zonation and making few small-scale adjustments).

Spatial decision support tools allow the comparison of thematic spatial data and quantitative assessment of planning alternatives. They help in calculating the complex consequences of multiple alternatives and summarising them in a relatively objective way (when compared to decisions being based purely on human intuition).

PRACTICAL TIPS

- Some decision support tools facilitate stakeholder involvement.
- Geographic information systems (GIS) can partly be used as decision support tools, but the designated tools typically have some additional features. See a guide for selecting decision support tools by the Center for Ocean Solutions (2011) for more information.
- Spatial optimisation modelling using decision support tools is one way of quantitatively optimising sea use. For example, the spatial layers describing the interaction between all activity pairs could be used as "cost layers". The model would then calculate the optimum arrangement of the activities in a way that minimises the cumulative "costs" based on predefined criteria.
- The model proposal for optimum sea use could be used as a basis for discussions by planners and stakeholders. The model criteria and input data can be edited and the modelling repeated to explore alternative scenarios.

11.4 FINALISE BOUNDARIES IN SPATIAL RESULTS OF MSP

11.4 VIIMEISTELE ALUERAJAUKSET TULOKSISSA

11.4 VIIMISTLE LÕPLIKUD MATERJALIDE PIIRID TULEMUSTES

Finalise the boundaries of the spatial analysis results and plans (such as sea use zones). Background information and recommendations for the MSP process should be directly based on existing data, the results of quantitative analyses and simple classifications. However, at later stages of the MSP process when planning results are produced, the precise boundaries of e.g. sea use zones (areas allocated for different uses) may be edited for practical reasons.

PRACTICAL TIPS

- Boundaries of sea use zones should be as simple as possible, e.g. consisting of straight line segments. This way they can be reported as a few coordinate pairs (and information on the coordinate reference system). In addition, the zones should follow relevant existing boundaries and exploit clear landmarks where possible (e.g. one corner of an area located at the tip of a headland).
- The spatial planning result layers are used at multiple spatial scales. They potentially need to be shown on top of multiple scale versions of the background data (such as coastline 1:100 000 and 1:1 000 000). Therefore, simple borders should always be preferred.

IV. VISUALISE MSP ON MAPS

The last phase of the MSP spatial data analysis consists of the visualisation of the spatial analysis results on maps. Visualisation of spatial data is as important as the data itself. Through careful visualisation, it is possible to communicate spatial information objectively and clearly, avoid misunderstandings and enable justified evaluation of the data and the MSP results. An inseparable part of the presentation of the MSP results is reporting the utilised spatial data and analysis methods.

Finally, the spatial results (maps, spatial data and metadata) of the MSP process are stored and distributed to a wider public. Cross-border interaction is facilitated by taking into account common frameworks and practices in visualisation choices and metadata. Moreover, the structure and languages of both spatial data and metadata influence the usability of the results across borders.

IV. VISUALISE MSP ON MAPS

IV. MERIALUESUUNNITTELUN KARTTAVISUALISOINTI

Merialuesuunnittelun paikkatietoprosessin viimeisessä osiossa tuotetaan aineistojen ja analyysitulosten karttavisualisointeja. Valmiiden karttatuotteiden laatiminen suunnitteluprosessin käyttöön on vähintään yhtä olennainen työvaihe kuin alueellisten vuorovaikutussuhteiden analysointi. Huolellisesti laadittujen karttojen avulla tulokset voidaan esittää objektiivisesti ja selkeästi, ja aineistojen ja suunnittelutulosten arviointi on mahdollista. Tulosten esittämisen lisäksi esitetään myös niiden tuottamiseen käytetyt aineistot ja menetelmät.

Paikkatietotyöskentelyn tulokset, kartat, aineistot ja metatiedot tallennetaan ja jaetaan halutuille kohderyhmille. Yhteisesti sovitut periaatteet visualisoinnin ja aineistokuvauksen tavoista parantavat erityisesti kansainvälisten suunnitteluprosessien sujuvuutta. Aineistojen ja metatietojen rakenne- ja kielivalinnat vaikuttavat tulosten käytettävyyteen hallintorajojen yli.

IV. MEREALA RUUMILISE PLANEERIMISE KAARTIDELE VISUALISEERIMINE

Mereala planeerimimise ruumiandmete analüüsi viimane etapp hõlmab ruumianalüüsi tulemuste visualiseerimist kaartidel. Ruumiandmete visualiseerimine on sama oluline kui andmed ise. Ettevaatliku visualiseerimise abil on võimalik ruumiandmeid objektiivselt ja selgelt edastada, vältida arusaamatusi ning võimaldada andmete ja mereala ruumilise planeerimise tulemuste põhjendatud hindamist. Mereala ruumilise planeerimise tulemuste esitamise lahutamatu osa on kasutatud ruumiandmete ja analüüsimeetodite aruandlus.

Lõpuks salvestatakse ja jagatakse mereala planeerimise protsessi ruumilised tulemused (kaardid, ruumiandmed ja metaandmed) laiemale üldsusele. Piiriülest suhtlemist hõlbustab visuaalsete valikute ja metaandmete ühiste raamistike ja tavade arvessevõtmine. Lisaks mõjutavad nii ruumiandmete kui ka metaandmete struktuur ja keeled tulemuste kasutatavust piiriüleselt.

STEP 12. VISUALISE SPATIAL INFORMATION

In this step, the results of the MSP process (either intermediate or final) are visualised for communicating them to planners, authorities, stakeholders and the general public. Visualisation of the MSP background information, scenarios and spatial plans on maps is much more effective in communicating the information than narratives.

VAIHE 12. PAIKKATIEDON VISUALISOINTI
Merialuesuunnittelun paikkatietoanalyysien välivaiheet ja valmiit tulokset visualisoidaan tarpeen mukaan valmiiksi karttatuotteiksi, joiden avulla tieto välitetään suunnittelijoille, viranomaisille, suunnittelun osapuolille ja julkisuuteen. Karttavisualisointi on huomattavasti tekstidokumenttia tehokkaampi keino välittää taustatietoa, skenaariotietoa ja aluesuunnitelmia.

ETAPP 12. RUUMIANDMETE VISUALISEERIMINE
Selles etapis visualiseeritakse mereala ruumilise planeerimise protsessi tulemusi (kas vahepealne või lõplik), et edastada neid planeerijatele, ametiasutustele, sidusrühmadele ja üldsusele. Mereala planeerimise taustteabe, stsenaariumide ja planeeringute visualiseerimine kaartidel on teabe edastamisel palju tõhusam kui narratiivid.

12.1 CREATE VISUALISATION PLAN: IDENTIFY AIMS FOR SPATIAL DATA VISUALISATION

12.1 LAADI VISUALISOINTISUUNNITELMA: TUNNISTA KARTTAVISUALISOINNIN TARPEET

12.1 KOOSTA VISUALISEERIMISKAVA: TUVASTA RUUMIANDMETE VISUALISEERIMISE EESMÄRGID

To design best possible maps, make a visualisation plan. In the plan, list the spatial outputs of the MSP process and determine their aims. The plan should conform to the overall goals of the MSP process and follow the guidance document. The visualisation choices depend on following aspects:

- Phase of the MSP process, e.g.: stage-setting phase, intermediate phase, final stage, monitoring/evaluation stage
- Content of the map: current conditions and their dynamics, spatial interactions, future conditions, scenarios, maritime spatial plan
- Target group of the visualisation, e.g.: internal use (planners), authorities, stakeholders, general public
- Publication type, e.g.: physical maps, static digital maps, three-dimensional views, spatial animations, interactive map views
- Context: stand-alone map, illustration in report, atlas

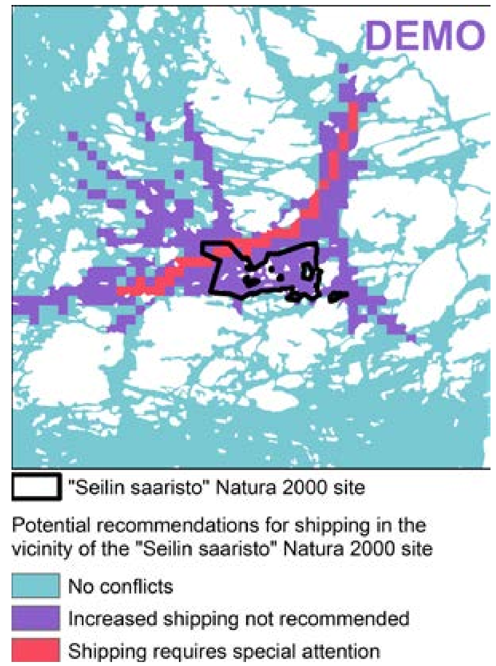


Figure 7. Example of a map visualisation of analysis results that are intended as an example, not actual MSP information. Note the "DEMO" label as well as the missing north arrow, scale bar and place names.

Each type has different potential and preconditions. For example:

- Maps of final maritime spatial plans for the wide public should be as plain, clear and visually well designed as possible
- Drafts with large amounts of information and unpolished symbology may be acceptable for internal use
- Interactive map views, such as in MSP spatial data portals, use predefined symbology to visualise data. Since the map view can be zoomed and data layers turned off and on, the portals have different (and less strict) requirements for visualisation than static maps
- The vertical dimension and temporal dimension can be incorporated into visual outputs using three-dimensional views and animations

Maps are powerful ways of communicating information and easily redistributed. Thus, they are also easily used out of their context and their message misinterpreted or misused. Intermediate analysis results and intermediate versions of spatial plans should be handled carefully.

PRACTICAL TIPS

- Generally, precise numbers and detailed borders should only be used when communicating final official results. To highlight their intermediate nature, values in maps can be reclassified into non-numeric scales and resampled to mask spatial details. The maps can also be clearly labelled as "drafts", "demos", "scenarios", "options", "illustrations" etc. (preferably on top of the map image itself so that it cannot be cropped out; Figure 7).
- Non-figurative (scenario) maps (Milestad et al. 2014) can be used for communicating scenarios and other types of intermediate information. Generally, they aim at illustrating the main characteristics of spatial phenomena "at a glance" instead of being accurate maps. This is done for example by avoiding numeric values and precise borders.

12.2 DETERMINE UNIFORM GUIDELINES FOR SPATIAL DATA VISUALISATION

12.2 MÄÄRITTELE YHDENMUKAISET KÄYTÄNNÖT PAIKKATIEDON VISUALISOINTIIN

12.2 MÄÄRA ÜHTSED SUUNISED RUUMIANDMETE VISUALISEERIMISEKS

Determine guidelines for creating harmonious visualisations of the spatial results. The following aspects may be considered to improve visual impression and comparability of spatial outputs (choosing one option or a selection of them):

- Uniform formats of published maps (web page, digital document, printed report, static or interactive)
- Uniform image sizes and spatial extents for map layouts
- Uniform spatial scales for map layouts
- Uniform CRS for map layouts
- Uniform colour and symbol selections for map layouts
- Logos and their placement

Each visualisation is unique and has unique requirements for visual design. The guidelines must therefore be flexible and allow exceptions.

12.3 PREPARE VISUALISATIONS CONSIDERING BEST PRACTICES

12.3 NOUDATA VISUALISOINNISSA KARTOGRAFISEN VIESTINNÄN PERUSKÄYTÄNTÖJÄ

12.3 JÄLGIGE VISUALISEERIMISEL KARTOGRAAFILISE KOMMUNIKATSIOONI PÕHITAVASID

When working with each visualisation, follow best practices in cartography. They outline for example general principles for the content, elements, use of colours, shapes, patterns, text and other types of information in maps. In addition, they guide the selection of metadata to be included in the visualisations.

PRACTICAL TIPS

- There are a few extensive and clear guides, for example those of Peterson (2009) and Brewer (2015).

12.4 VISUALISE UNCERTAINTY AND DATA GAPS

12.4 VISUALISOI TIETOJEN EPÄVARMUUS JA TIEDON PUUTTEET

12.4 VISUAALISEERI EBAMÄÄRASUS JA ANDMELÜNGAD

Visualise uncertainty and data gaps on maps. Including this information on maps (in addition to metadata and e.g. report text) can be used to improve the transparency of the spatial data process and facilitate the evaluation of the results. For example, areas with missing information can be shown on the map and uncertain observations can be labelled with specific symbols.

PRACTICAL TIPS

- For example, one of the input layers used for calculating an aggregate spatial data layer may have covered only one part of the plan area / analysis area. Thus, the result must be examined acknowledging this input data gap. The result can be visualised on a map where e.g. a transparent layer on top of the aggregate data layer signals the extent of the input data gap.

12.5 EXPLORE VISUALISATION TRICKS

12.5 TUTKI ERILAISIA VISUALISOINTIKEINOJA

12.5 AVASTA VISUALISEERIMISE NIPPE

Use geoprocessing methods to improve map visualisations. Report analyses clearly in the map metadata.

PRACTICAL TIPS

- Report for example the name of the method, applied radius and weight field (depending on the method) in the metadata.
- For example, add jitter to point data to visualise many observations with identical coordinates. Utilise density analysis for visualizing (point and line) data.
- For another example, large point data of oil spills with many overlapping observations can be visualised using heat map symbology (Figure 8). This method visualises the density of points as a continuous colour gradient, which may easier to interpret than the original point data.

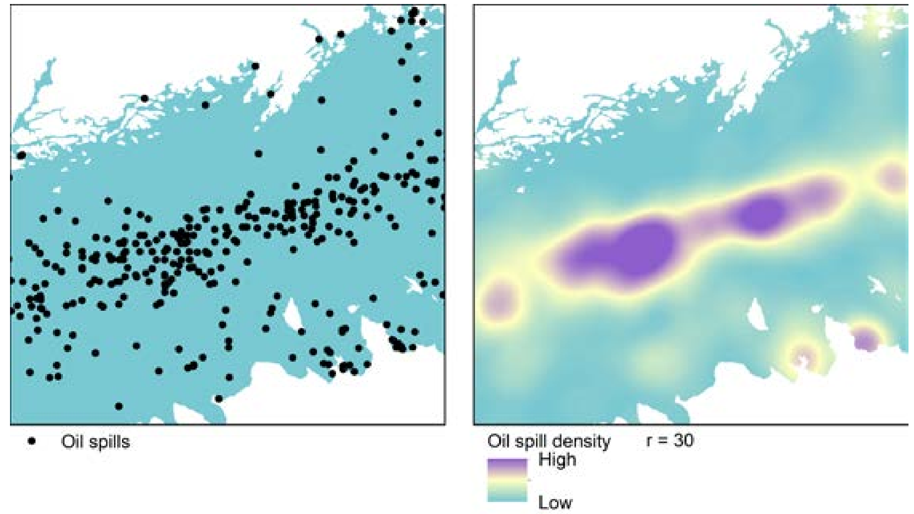


Figure 8. A heat map visualisation of marine oil spill point data (with Kernel density search radius r = 30). The original point data has a large number of overlapping observations, making it challenging to visualise. (Data: HELCOM HOLAS II Dataset: Illegal oil discharges 2018)

12.6 EVALUATE MAPS

12.6 ARVIOI KARTTOJEN LAATU

12.6 HINDA KAARTIDE KVALITEETI

A map is never perfect and map visualisation should be an iterative process. Peer or public evaluation are useful for improving map design and removing errors. Cross-border comparison of MSP maps may be useful and facilitate international cooperation.

STEP 13. REPORT SPATIAL DATA AND ANALYSES

In this step, the maps and spatial data products are supplied with appropriate metadata. They will allow evaluation and examination of the input data, methods and results and their limitations. In addition, they will enhance transferability of the workflows across sectoral and administrative borders and reproduction of the analyses during successive MSP rounds.

VAIHE 13. PAIKKATIETOAINEISTOJEN JA -ANALYYSIEN RAPORTOINTI

Kartoille ja paikkatietoaineistoille laaditaan riittävän kattavat metatietokuvaukset, joiden perusteella lähtöaineistojen, analyysimenetelmien ja tulosten arviointi on mahdollista. Kuvailutietojen avulla myös työnkulkujen siirrettävyys hallinnollisten rajojen ja sektorirajojen yli sekä vastaavien prosessien toistaminen tulevien suunnittelukertojen yhteydessä helpottuvat.

ETAPP 13. RUUMIANDMETE JA ANALÜÜSIDE ARUANDLUS

Kaartidele ja ruumiandmekogumite koostatakse piisavalt laiaulatuslikud metaandemete kirjeldused, et võimaldada lähteandmete, analüüsimeetodite ja tulemuste hindamist. Kirjeldused hõlbustavad töövoogude ülekandmist üle haldus- ja sektoripiiride ning sarnaste protsesside kordamist tulevastes planeerimisprotsessides.

13.1 FINALISE METADATA CATALOGUE

13.1 VIIMEISTELE METATIETOLUETTELO

13.1 VORMISTA LÕPLIKULT METAANDMETE KATALOOG

Check and update the metadata catalogue (Step 5.1) for all spatial data created and used in the MSP process.

13.2 INCLUDE CITATIONS TO INPUT DATA

13.2 LISÄÄ LÄHDEVIITTEET

13.2 LISAGE SISENDANDMETELE VIITED

Cite all input data and methodology so that it can be evaluated and accessed easily. Include the citations for example in reports, metadata and map captions.

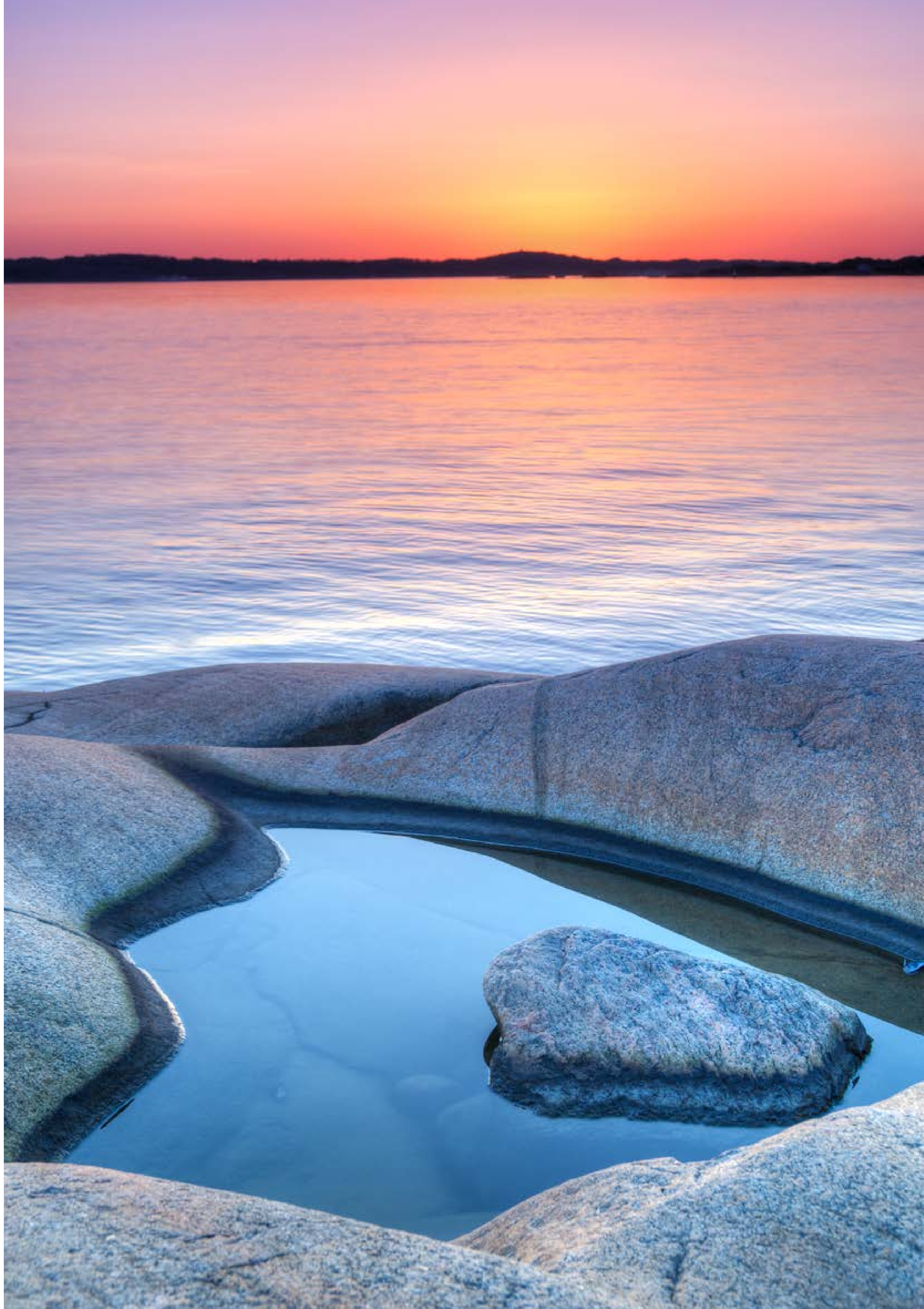
13.3 PREPARE METADATA SUMMARIES FOR MAPS AND SPATIAL DATASETS

13.3 LAADI METATIETOYHTEENVEDOT KARTOILLE JA PAIKKATIETOAINEISTOILLE

13.3 KOOSTA KAARTIDE JA RUUMIANDMEKOGUMITE METAANDMETE KOKKUVÕTTED

Write summaries of the most fundamental information for each spatial data visualisation and dataset. The information includes input data and its quality, used analysis methods and their restrictions. These summaries should be used in map captions and/or layouts and in the general descriptions of digital data products.

Although metadata sheets are available, they may not be read through by users of maps and spatial data. The short descriptions are therefore important for communicating the most essential information.



STEP 14. STORE AND DISTRIBUTE MSP DATA

In this last step, the intermediate and final outputs of the spatial data analyses in MSP are stored and distributed to a wider public. It allows planners, authorities, stakeholders and the general public across sectoral and administrative borders to access, examine and evaluate the key results that form the basis for MSP. Public distribution of the data enhances transparency of the planning process, stakeholder involvement in the process, communication of plans and transferring ideas to other areas.

VAIHE 14. AINEISTOJEN TALLENNUS JA JAKELU
Suunnitteluprosessin aikana tuotetut aineistot tallennetaan, ja niitä voidaan jakaa sidosryhmille tai suurelle yleisölle. Tällöin suunnittelijat, viranomaiset ja muut osapuolet voivat tarkastella ja arvioida suunnitteluprosessien tuloksia. Aineistojen julkinen jakaminen parantaa suunnitteluprosessin läpinäkyvyyttä, osapuolten osallistamista, ja valmiiden suunnitelmien viestintää.

ETAPP 14. ANDMETE SALVESTAMINE JA LEVITAMINE
Planeerimisprotsessi viimases etapis salvestakse ja jagatakse ruumilise andmeanalüüsi vahe- ja lõpptulemused laiemale üldsusele. See võimaldab planeerijatel, ametiasutustel, sidusrühmadel ja avalikkusel uurida ja hinnata peamisi tulemusi. Andmete avalik levitamine suurendab planeerimisprotsessi läbipaistvust, osapoolte kaasatust ja lõpetatud plaanide edastamist.

14.1 IDENTIFY ESSENTIAL MSP SPATIAL DATA FOR DISTRIBUTION

14.1 TUNNISTA KESKEISET JAETTAVAT PAIKKATIETOAINEISTOT

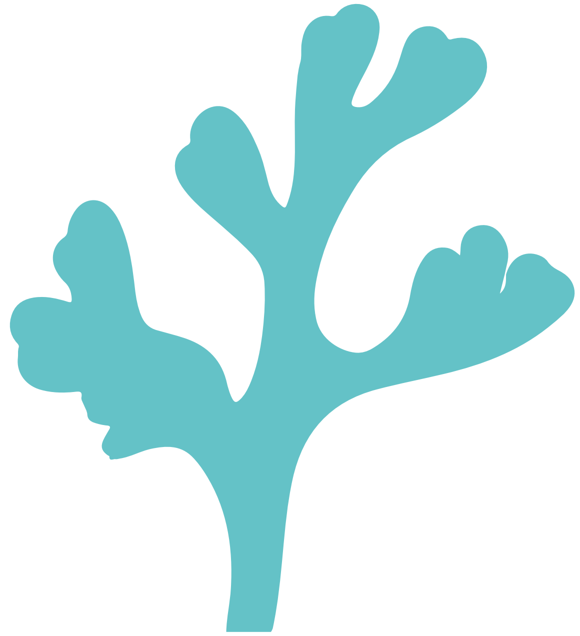
IDENTIFITSEERIGE LEVITAMISEKS OLULISED RUUMIANDMED

Identify those spatial data that are relevant for distributing to a wider public. These may include key data on the current environmental conditions and human activities, scenarios or planning options and maps of final spatial plans.

PRACTICAL TIPS

- Make a distinction between new datasets created in the MSP process and input data created by other providers.
- It may be advisable to only distribute original data created in the MSP process. Providing adequate citations for background data gives end-users the possibility to access these data through original providers' databases, which is in many cases most appropriate and practical (e.g. Fowler et al. 2010).
- Identify data layers relevant for stakeholders. These may include a raster layer of the maritime spatial plan, vector layers for sea use "zoning", spatial interaction data for marine activities (conflict areas etc.) and layers indicating the potential areas for different activities (based on analyses).

IV. VISUALISE MSP ON MAPS



14.2 IDENTIFY WAYS TO DISTRIBUTE DATA

14.2 TUNNISTA AINEISTOJEN JAKELUKANAVAT

14.2 TUVASTAGE ANDMETE LEVITAMISE KANALID

Identify a practical way for distributing MSP spatial data to the wider public. MSP spatial data portals (interactive web-based services for viewing and downloading spatial data) or marine atlases (web-based services and/or printed atlases of static cartographic visualisations of selected data) are two of the most common ways of distributing spatial MSP data and maps.

Consider whether or not viewing, downloading and interactive analysis and visualisation capabilities are all needed and if you have the resources to implement them. The user needs to be able to browse metadata in the data portal before making a decision on downloading the spatial data.

PRACTICAL TIPS

- In addition to detailed metadata, the key information (e.g. major disclaimers) should be summarized and visible for all users without opening a separate metadata file.
- Identify the best way to store and distribute spatial data. Consider data origin, rights, open access possibilities, data layer size, format, CRS, version information and metadata.
- For example, the distribution of MSP spatial data may require a database including original and background data. In addition, an online map application would be needed to give users the possibility to view these data. Original data could then be downloaded in spatial format through the application, while background data would be merely visualised and described. This service can be incorporated into existing spatial data applications.
- The simplest way to distribute (a limited amount of) spatial MSP data would be to publish map visualisations as images on a web page and provide download links for the most important spatial data and metadata.

14.3 PREPARE SPATIAL DATA FOR PUBLICATION

14.3 VALMISTELE AINEISTOT JULKAISUA VARTEN

14.3 VALMISTA ETTE RUUMIANDMED AVALDAMISEKS

Triple-check spatial data files and metadata. Extract up-to-date metadata from the metadata catalogue for each spatial dataset to be published. Create a metadata sheet for each dataset and ensure that it is published with the data.

Pack the spatial data files and their metadata sheet together in order to ensure that the end-users have convenient and automatic access to the metadata. In addition, use the metadata summary (13.3) for a general description of the spatial data, its origin and quality in the data portal.

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APPENDIX

Example of a data provider inventory. The example presents a non-exhaustive list of data providers that were utilised in the mapping of the current environmental conditions and human uses of the Gulf of Finland in project Plan4Blue (March 2019).

Esimerkki aineistotuottajien inventoinnista. Listalla esitetään Plan4Blue-hankkeen ympäristön tilan ja ihmistoiminnan tilannekartoituksessa käytettyjen aineistojen toimittajat (maaliskuu 2019).

Andmeesitajate nimekiri. Loendis on toodud Plan4Blue keskkonnaseisundi ja inimtegevuste hetkeseisu uuringu jaoks kasutatud andmematerjali esitajaid (märts 2019).

PROVIDER TUOTTAJA ANDMEESITAJA	SPATIAL COVERAGE ALUEELLINEN KATTAVUUS RUUMILINE ULATUS
IMO - International Maritime Organization	International
HELCOM - Helsinki Commission	International
EMODnet - The European Marine Observation and Data Network	International
European Environment Agency	International
Ramsar	International
Bureau van Dijk	International
Finnish Transport Agency	Finland
National Land Survey of Finland	Finland
Statistics Finland	Finland
Finnish Environment Institute SYKE	Finland
Geological Survey of Finland	Finland
Finnish Wind Power Association and Etha Wind Oy	Finland
Estonian Land Board	Estonia
Estonian Maritime Administration	Estonia
Estonian Environment Agency	Estonia
Statistics Estonia	Estonia
Estonian Environment Agency	Estonia
Projects	International / Estonia Finland / regional

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