
FORCOAST



Earth Observation Services For Wild Fisheries, Oystergrounds
Restoration And Bivalve Mariculture Along European Coasts

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Executive Summary

This document is an update of deliverable D3.2 *Data Warehouse (DWH) use for 2020*. Its purpose is to list the Earth Observation datasets used by the different partners within the FORCOAST project during 2021, together with their sources.

The introduction refers the reader back to deliverable D3.2 for more information on the DWH Core and Additional datasets available from the Copernicus Space Component Data Access (CSCDA) site, and for details behind the reasons for the lack of use of these datasets by the partners.

The main section describes the datasets used in each pilot area, indicating their source, a link to obtain further information about them or, where possible, to access the data directly.

The references section includes most of the links provided throughout the text.

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Acronyms and abbreviations

CMEMS: Copernicus Marine Environment Monitoring Service

CSCDA: Copernicus Space Component Data Access

DWH: Data Warehouse

NWP: Numerical Weather Prediction



1 Introduction

This deliverable presents an update of the datasets used by each FORCOAST partner during year 2021 compared to those expected to be used during the same period, which were presented in deliverable D3.2 earlier this year. While that deliverable, together with the results of a survey on datasets usage by the different partners of the project, included information about the catalogue of products available from the Copernicus Space Component Data Access (CSCDA) Data Warehouse (DWH) –CORE and ADDITIONAL datasets–, this document focuses on the datasets finally used by each pilot. The reader should refer to deliverable D3.2 for further information on DWH datasets.

At this point in the project, with seven months left before its conclusion, the models created for each of the pilot areas and the service modules designed to answer user requirements from the different FORCOAST sectors are both reaching their final development stage. Therefore, the list of previously considered datasets has been narrowed down to those found to be the most appropriate for the operational implementation of the models. With this idea in mind, and as mentioned above, this document presents the list of datasets finally selected to be used in each pilot area, as well as their purpose (model validation, model forcing, direct use or others). For a detailed explanation about the implemented models, the reader is referred to deliverable D3.8.

As was seen in deliverable D3.2, the high-resolution DWH datasets are, in general, not used in the pilot areas defined in the project. The reasons given in that deliverable based on feedback from the pilots, some of which are still valid today, are:

1. They did not know about the benefits/existence of the ADDITIONAL datasets: This point has been addressed since then, with an online presentation given by Federico Falcini (CNR) where the different kinds of HR datasets were presented.
2. They do not find them useful for their project pilots: Most pilots find the datasets they are currently using more appropriate for the service modules being developed.
3. The Pilots do not indicate usefulness of the datasets at this stage.
4. The DWH datasets require substantial pre-processing to be translated into variables relevant to the pilots.

Other reasons given by the pilots for the limited use of the DWH datasets are given throughout this document in their respective pilot subsection.

2 Datasets used in each pilot area

The datasets used by each pilot are listed below, grouped by the use given to them. Within each group, their source and the selected variables in each of them are indicated.

2.1 Pilot 1 – Portugal

2.1.1 Direct use

This pilot reports that no datasets are directly used.



2.1.2 Model forcing

CMEMS

[GLOBAL ANALYSIS FORECAST PHY 001 024](#): Up to 6-hourly global ocean analysis and forecast system at 1/12° which contains physical variables such as sea water temperature, salinity, sea surface height and water velocity.

[IBI ANALYSISFORECAST BGC 005 004](#): Daily L4 high resolution (0.028°) biogeochemical forecast, which provides dissolved molecular oxygen, phosphate, ammonium and chlorophyll.

Instituto Português do Mar e da Atmosfera (IPMA)

[IPMA](#) provides outputs of the meteorological AROME model at a resolution of 2.5km, which are used as atmospheric forcing by the pilot.

IST

The pilot also uses the WRF model at a resolution of 3km for atmospheric forcing provided by IST.

MOHID

The pilot uses the [MOHID land model](#) for land forcing.

2.1.3 Model validation

CMEMS

[OCEANCOLOUR GLO CHL L4 NRT OBSERVATIONS 009 033](#): Daily L4 1/24° resolution chlorophyll dataset.

[OCEANCOLOUR GLO OPTICS L4 NRT OBSERVATIONS 009 083](#): Daily L4 1/24° resolution optics product which provides the concentration of suspended matter in sea water.

[SST ATL SST L4 NRT OBSERVATIONS 010 025](#): Daily L4 high resolution (0.02°) sea surface temperature dataset.

[OCEANCOLOUR ATL CHL L4 NRT OBSERVATIONS 009 037](#): Daily L4 high resolution (1km) chlorophyll dataset.

[OCEANCOLOUR EUR CHL L3 NRT OBSERVATIONS 009 050](#): Daily L3 high resolution (1km) chlorophyll dataset.

[OCEANCOLOUR ATL OPTICS L3 NRT OBSERVATIONS 009 034](#): Daily L3 high resolution (300m) optics product which provides, among other variables, the concentration of suspended matter in sea water.

2.1.4 DWH datasets

No DWH datasets are used in this pilot area.

2.1.5 Differences between 2021 prevision and final use

No differences were reported between the expected and final use of datasets for 2021.

2.2 Pilot 2 – Spain

2.2.1 Direct use

This pilot has no direct use datasets.

2.2.2 Model forcing

The following datasets are used to force this pilot's models:

CMEMS

[IBI ANALYSISFORECAST PHY 005 001](#)

- `cmems_mod_ibi_phy_anfc_0.027deg-3D_PT1H-m`: Hourly 3D fields of current speed components (u_0 , v_0), temperature ($theta_0$) and salinity (so).
- `cmems_mod_ibi_phy_anfc_0.027deg-2D_PT1H-m`: Hourly 2D fields of sea surface height (zos).

MeteoGalia

[12-hourly WRF 12km resolution 2D model output](#) used for atmospheric forcing: Air temperature at 2m ($temp$), sea surface temperature (sst), relative humidity at 2m (rh), precipitation rate ($prec$), downward short-wave radiation ($swflx$), downward long-wave radiation ($lwflx$) and wind components at 10m (u , v).

Euskalmet

WRF 1km resolution 2D model output used for atmospheric forcing (AZTI FTP server): Air temperature at 2m ($t2m$), sea surface temperature (tsk), relative humidity at 2m ($rh2$), precipitation rate (pre), downward short-wave radiation (swd), downward long-wave radiation (lwd) and wind components at 10m ($u10$, $v10$).

2.2.3 Model validation

The following datasets are used to validate this pilot's models:

CMEMS

[SST EUR SST L3C NRT OBSERVATIONS 010 009 b](#): Daily L3 sea surface temperature (sst) at 0.02° resolution.

[INSITU GLO UV NRT OBSERVATIONS 013 048](#): L2 *in situ* observations of sea currents, obtained from three different sources:

- DBCP's Global Drifter Program drifting buoys: Near-surface zonal and meridional velocities.
- European High Frequency Radar Network radars: Near-surface zonal and meridional total velocities and near-surface radial velocities.
- Argo floats: At parking depth and near-surface zonal and meridional velocities.

In the case of the SE of the Bay of Biscay, the data is provided by HF radars with a 5km spatial resolution.

NASA – Jet Propulsion Laboratory (JPL)

[GHRSSST Level 4 MUR Global Foundation Sea Surface Temperature Analysis \(v4.1\)](#): Daily L4 sea surface temperature (sst) at 0.01° resolution obtained from various satellite missions, microwave radiometers and *in situ* observations.

EuskOOS

Salinity and temperature profile data at fixed stations with a variable time frequency, from hourly to monthly, provided by [EuskOOS](#).

2.2.4 DWH datasets

No DWH datasets are used in this pilot area.

2.2.5 Differences between 2021 prevision and final use

This pilot has used the same datasets during 2021 they had initially planned to use.

2.3 Pilot 3 – Bulgaria

2.3.1 Direct use

The following datasets are used with the purpose of direct use:

CMEMS

[SST_BS_SST_L4_NRT_OBSERVATIONS_010_006](#): Daily L4 sea surface temperature high resolution (0.01°) dataset.

[BLKSEA_ANALYSISFORECAST_PHY_007_001](#): Daily L4 high resolution (0.025°) physical analysis dataset with variables such as temperature at different depths, salinity, sea surface height and water velocity.

[BLKSEA_MULTIYEAR_PHY_007_004](#): Daily L4 high resolution (0.037° x 0.028°) physical reanalysis dataset similar to the previous one.

European Space Agency (ESA)

Non-time critical (NTC) Sentinel products:

- [Sentinel 3 OLCI Ocean Colour Full Resolution](#): Chlorophyll concentration, diffuse attenuation coefficient and turbidity.
- [Sentinel 3 SLSTR Sea Surface Temperatures](#).

Both products can be downloaded from this [link](#).

2.3.2 Model forcing

CMEMS

[BLKSEA_MULTIYEAR_WAV_007_006](#): Hourly L4 high resolution (0.037° x 0.028°) waves reanalysis dataset with all the associated variables, such as significant height, mean period, direction, swell and Stokes drift.

2.3.3 Model validation

This pilot is not using any dataset for model validation during this period.

2.3.4 DWH datasets

No DWH datasets are used in this pilot area.

2.3.5 Differences between 2021 prevision and final use

The ESA Sentinel-3 datasets mentioned above were added to the list of used datasets during 2021.

2.4 Pilot 4 – Belgium

2.4.1 Direct use

Royal Belgian Institute of Natural Sciences (RBINS)

The [Marine Forecasting Centre](#) of the RBINS issues 5-day forecasts of the marine conditions in the North Sea twice a day. The related datasets are available at this [link](#).

[Physical State of the Sea - Belgian Coastal Zone - COHERENS UKMO](#): This hourly dataset contains the operational 3D baroclinic hydrodynamical COHERENS forecasts for the Belgian part of the North Sea. The domain covers the latitudes 51° to 51.9° and the longitudes 2.1° to 4.2° with a 0.0069° x 0.012° resolution grid. The sea surface is forced by the 6-hourly meteorological forecasts provided by the UK MetOffice. The used variables are sea velocity, salinity, temperature and sea surface elevation.

[Physical State of the Sea - North Sea - COHERENS UKMO](#): This dataset is similar to the previous one, but with forecasts for the North Sea. The domain covers the latitudes 48.5° to 57° and longitudes -4° to 9° with a 1/12° x 1/24° resolution grid. The used variables are the same as in the previous dataset.

[Tide - Continental Shelf - COHERENS UKMO](#): This hourly dataset contains the operational 2D barotropic hydrodynamical COHERENS tide forecasts for the Belgian part of the North Sea, providing sea surface elevation data, with latitudes from 48° to 62° and longitudes from -12° to 13°, and a resolution of 1/24° x 1/12°. The sea surface is forced by the 6-hourly meteorological forecasts provided by the UK MetOffice.

[Wave field - North Sea - WAM ECMWF](#): This hourly dataset contains the operational WAM wave forecasts for the sea state of the North Sea, covering latitudes from 48.5° to 57° and longitudes from -4° to 9° with a 1/15° x 1/10° resolution grid. The sea surface is forced by the hourly meteorological forecasts provided by the ECMWF (European Centre for Medium-Range Weather Forecasts). The used variables provided by the spectral analysis are significant wave height, wave direction and mean zero upcrossing period.

[Wave field - North Sea - WAM UKMO](#): Similar to the previous dataset, in this case the sea surface is forced by the 6-hourly meteorological forecasts provided by the UK MetOffice.

2.4.2 Model forcing

RBINS

[Harmonic Astronomical Tide - Continental Shelf - COHERENS](#): This hourly dataset, which provides the surface elevation above mean sea level (MSL), contains the operational 2D barotropic hydrodynamical COHERENS astronomical tide forecasts for the Belgian part of the North Sea, covering the area given by the following coordinates: latitudes from 48° to 62° with a 1/24° resolution; longitudes from -12° to 13° with a 1/12° resolution.

ECMWF

The seasonal forecasts provided by the ECMWF are also used in this pilot area to initialize their models. These forecasts provide wind at 10m, air temperature at 2m, atmospheric pressure at MSL, relative humidity or dew point at 2m, cloud coverage and total precipitation.

2.4.3 Model validation

Two CMEMS datasets are used for model validation in this pilot area.

[INSITU NWS NRT OBSERVATIONS 013 036](#): Sea wave height and sea surface elevation data are used from these *in situ* observations.

[NORTHWESTSHELF ANALYSIS FORECAST PHY 004 013](#): L4 high resolution (0.014° x 0.03°) physical analysis dataset which provides temperature and salinity with an hourly temporal resolution, and water velocity and sea surface height with a temporal resolution of 15 minutes.

2.4.4 DWH datasets

No DWH datasets are used in this pilot area.

2.4.5 Differences between 2021 prevision and final use

There were no differences between the expected and final use of datasets by this pilot in 2021.

2.5 Pilot 5 – Ireland

2.5.1 Direct use

The model developed by the pilot is directly used in this area:

Marine Institute

Inner Galway Bay model: Currents, sea temperature, salinity and coliform bacteria and/or tracers.

2.5.2 Model forcing

This pilot area uses the following data for both atmospheric and land forcing.

- Atmospheric forcing: Hourly 0.1° ECMWF atmospheric fields.
- Land forcing: NRT discharge data of the Corrib, Clarin and Dunkellin rivers, together with daily climatology based on a 2007-2019 time series.

2.5.3 Model validation

Marine Institute and Cuan Beo

Five non-public datasets are produced locally by the Marine Institute and Cuan Beo and used to validate the model developed by the pilot:

- Temperature series from loggers located at Kinvara and Killeenaran farms.
- Weekly temperature and salinity measurements at Killeenaran farm from a CO 310 hand-held sensor
- Surveys in Galway Bay to get temperature and salinity profiles.

- ADCP data from three moorings in Galway Bay during summer 2018.

2.5.4 DWH datasets

No DWH datasets are used in this pilot area.

2.5.5 Differences between 2021 prevision and final use

- Initially, the pilot expected to develop a biogeochemical module under the project. For this reason, the [IBI ANALYSISFORECAST BGC 005 004](#) CMEMS dataset, with its chlorophyll, nitrates, ammonia and phosphates variables, had been chosen for this purpose, as well as the Galway Bay Observatory fluorometer data. As this module will not be developed at this stage, these datasets will not be used.
- At an earlier stage in the development process the [INSITU IBI NRT OBSERVATIONS 013 033](#) CMEMS dataset was earmarked for future use, but after a closer analysis it was found not to be suitable for validating their small-scale model, since the observations are too sparse.
- The datasets produced locally by Marine Institute and Cuan Beo mentioned in the model validation section have been added since D3.3.

2.6 Pilot 6 – Denmark

2.6.1 Direct use

No datasets are reported to be directly used by this pilot.

2.6.2 Model forcing

CMEMS

[NWSHELF ANALYSISFORECAST PHY LR 004 001](#): Daily L4 high resolution (0.111° x 0.067°) physical model dataset which provides sea temperature, salinity and sea level used by the pilot.

[BALTICSEA ANALYSISFORECAST PHY 003 006](#): Up to 15-minute temporal resolution L4 physical dataset with a spatial resolution of 2km. This dataset provides the same variables as the previous one.

Danish Meteorological Institute (DMI)

The [DMI](#) runs different NWP models, among which are two used by this pilot:

- The [Harmonie NWP model](#) at a 2.5km resolution, used as atmospheric forcing.
- The [HBM 3D ocean model](#).

Soil & Water Assessment Tool (SWAT)

As stated in the [website](#) where this land model can be downloaded from, “SWAT is a small watershed to river basin-scale model used to simulate the quality and quantity of surface and ground water and predict the environmental impact of land use, land management practices, and climate change”. This model is used as land forcing input by the pilot.

Hydrological Predictions for the Environment (HYPE)

The Hydrological Predictions for the Environment (HYPE) model is a semi-distributed, physically based catchment model, which simulates water flow and substances on their way from precipitation through

different storage compartments and fluxes to the sea (Lindström et al., 2010) ([source](#)). It is also used by the pilot as land forcing input.

2.6.3 Model validation

- In situ sea level observations carried out by the DMI are used as model validation.
- Overfladevandsdatabasen ODA (Aarhus university): Database which contains biogeochemical and sea level data, part of NOVANA, Denmark's Nationwide Monitoring and Assessment Programme for the Aquatic and Terrestrial Environments. [More information](#) (in Danish) and [data visualization](#).

2.6.4 DWH datasets

No DWH datasets are used in this pilot area.

2.6.5 Differences between 2021 prevision and final use

No differences were reported between the expected and final use of datasets for 2021.

2.7 Pilot 7 – Romania

2.7.1 Direct use

CMEMS

[BLKSEA_ANALYSISFORECAST_WAV_007_003](#): Hourly L4 high resolution (0.037° x 0.028°) spectral wave model dataset that provides, among other variables, Stokes drift, significant wave height and mean wave period.

2.7.2 Model forcing

CMEMS

[BLKSEA_ANALYSISFORECAST_PHY_007_001](#): The variables used from this dataset are temperature, salinity, sea surface height and sea velocity.

[BLKSEA_ANALYSIS_FORECAST_BIO_007_010](#): Daily L4 high resolution (0.037° x 0.028°) dataset based on the Biogeochemical Model for Hypoxic and Benthic Influenced areas (BAMHBI) model. It provides analysis and forecast for 3D concentration of chlorophyll, nutrients (nitrate and phosphate), dissolved oxygen, phytoplankton carbon biomass, net primary production, pH, dissolved inorganic carbon, total alkalinity, surface partial pressure of CO₂ and surface flux of CO₂. All available variables are used by the pilot.

ECMWF

[ERA5](#): This dataset is used for atmospheric forcing, and it contains hourly estimates of a large number of atmospheric, land and oceanic climate variables. The data cover the Earth on a 30km grid and resolve the atmosphere using 137 levels from the surface up to a height of 80km. The variables used by the pilot are temperature at 2m (*T2M*), dewpoint temperature at 2m (*D2M*), wind velocity at 10m (*U10*, *V10*), pressure at mean sea level (*PMSL*), total cloud cover (*TCC*) and total precipitation (*PRECIP*).

PERSEUS

Dataset produced by the [EU FP7 PERSEUS project](#) and used for land forcing.

2.7.3 Model validation

CMEMS

[OCEANCOLOUR_BS_CHL_L4_NRT_OBSERVATIONS_009_045](#): Daily L4 300m resolution chlorophyll (*chlor_a*) dataset.

[OCEANCOLOUR_BS_CHL_L3_NRT_OBSERVATIONS_009_044](#): Daily L3 300m resolution chlorophyll (*chlor_a*) dataset.

[SST_BS_SST_L4_NRT_OBSERVATIONS_010_006](#): Daily L4 sea surface temperature high resolution (0.01°) dataset.

2.7.4 DWH datasets

No DWH datasets are used in this pilot area.

2.7.5 Differences between 2021 prevision and final use

- The high resolution optics [OCEANCOLOUR_BS_OPTICS_L3_NRT_OBSERVATIONS_009_042](#) product was initially expected to be used; instead, [OCEANCOLOUR_BS_CHL_L3_NRT_OBSERVATIONS_009_044](#) was used for model validation.
- In 2021 CMEMS published a new high resolution ocean colour dataset ([OCEANCOLOUR_BLK_BGC_HR_L4_NRT_009_212](#)) which contains L4 turbidity (*TUR*), solid particulate matter concentration (*SPM*), particulate backscattering at 443nm (*BBP443*) and chlorophyll-a concentration (*CHL*) for the Sentinel 2/MSI sensor at 100m resolution for a 20km coastal zone. The pilot expects to use this dataset for validation of chlorophyll concentration in the high resolution (200m) nested models.

2.8 Pilot 8 – Italy

2.8.1 Direct use

The following datasets are directly used in this area:

CMEMS

[OCEANCOLOUR_MED_CHL_L3_NRT_OBSERVATIONS_009_040](#): (dataset name: dataset-oc-med-chl-olci-l3-chl_300m_daily-rt) Daily L3 chlorophyll (*chlor_a*) at 300m resolution.

[SST_MED_SST_L3S_NRT_OBSERVATIONS_010_012](#): Daily L3 sea surface temperature (*sst*) at 0.01° resolution.

[OCEANCOLOUR_MED_CHL_L4_NRT_OBSERVATIONS_009_041](#): (dataset name: dataset-oc-med-chl-multi-l4-interp_1km_daily-rt-v02) Daily L4 chlorophyll (*chlor_a*) at 1km resolution.

CoastColour

The [CoastColour](#) project was launched by the European Space Agency to fully exploit the potential of the MERIS instrument for remote sensing of the coastal zone.

CoastColour_L2W_conc_chl_nn: Full resolution surface chlorophyll.

CoastColour_L2W_conc_tsm: Full resolution surface total suspended matter

2.8.2 Model forcing

The following datasets are used to initialize the models created by the pilot:

CMEMS

[MEDSEA_ANALYSISFORECAST_PHY_006_013](#): L4 coupled hydrodynamic-wave model at 1/24° resolution. The following variables are used:

- Sea water velocity (u , v), with a temporal resolution of up to 15 minutes.
- Hourly sea water potential temperature (T)
- Hourly salinity (S)

[MEDSEA_ANALYSISFORECAST_BGC_006_014](#): Daily L4 dataset that contains several biogeochemical variables at 1/24° resolution.

ARSO Meteo

The [Slovenian Environment Agency](#) publish operational products based on the [ALADIN](#) model that are used by this pilot as atmospheric forcing.

2.8.3 Model validation

No datasets were used for model validation in this pilot.

2.8.4 DWH datasets

This pilot had previously reported that they expected to use DWH Additional datasets to help them investigate biogeochemical small-scale patterns over the study area. However, after carrying out preliminary tests it was found that setting up a daily-based processing operative chain was unfeasible. On the other hand, the available variables do not meet the user's needs.

2.8.5 Differences between 2021 prevision and final use

- The sea surface temperature [SST_MED_SST_L4_NRT_OBSERVATIONS_010_004](#) product with ultra-high (0.01°) spatial resolution was expected to be used in 2021, but instead it will be used in 2022 with the purpose of model forcing, as well as real-time discharge data for the Po river and climatology for other minor rivers, that will be used for land forcing.
- Since May 2021, CMEMS have published chlorophyll datasets with a 300m resolution under the product [OCEANCOLOUR_MED_CHL_L3_NRT_OBSERVATIONS_009_040](#) (dataset name: dataset-oc-med-chl-olci-l3-chl_300m_daily-rt). Before this dataset was available, the partners working in this pilot area used data from Eumetsat. This dataset is also expected to be used to validate the pilot's models in 2022.

3 References

- CMEMS catalogue:
<https://resources.marine.copernicus.eu/products>
- Instituto Português do Mar e da Atmosfera:
<https://www.ipma.pt/en/index.html>
- MOHID land model:
http://www.mohid.com/pages/models/mohidland/mohid_land_home.shtml
- Meteogalicia WRF 2D 12km model outputs:
http://mandeo.meteogalicia.gal/thredds/catalog/wrf_2d_12km/fmrc/files/catalog.html
- NASA JPL MUR model:
<https://podaac.jpl.nasa.gov/dataset/MUR-JPL-L4-GLOB-v4.1>
- EusKOOS:
<https://www.euskoos.eus/en/>
- Sentinel data access:
<https://sentinels.copernicus.eu/web/sentinel/sentinel-data-access>
- RBINS ERDDAP:
<https://erddap.naturalsciences.be/erddap/griddap/index.html?page=1&itemsPerPage=1000>
- DMI:
 - Harmonie NWP model information:
<http://research.dmi.dk/research/research-topics/numerical-weather-prediction/>
 - DMI HBM 3D ocean model:
<http://ocean.dmi.dk/models/hbm.uk.php>
- SWAT model:
<https://swat.tamu.edu/>
- HYPE model:
<https://hypeweb.smhi.se/about-us/about-the-model/>
- Overfladevandsdatabasen ODA information and visualization:
 - <https://mst.dk/media/141463/novana-2017-21-programbeskrivelse.pdf>
 - <https://arealinformation.miljoportal.dk/html5/index.html?viewer=distribution>
- ECMWF ERA5 information:
<https://www.ecmwf.int/en/forecasts/datasets/reanalysis-datasets/era5>
- PERSEUS project information:
 - <http://www.perseus-net.eu/site/content.php?locale=1&sel=1>
 - http://www.perseus-net.eu/site/content.php?locale=1&locale_j=en&sel=558, D4.6
 - <https://www.sciencedirect.com/science/article/abs/pii/S0079661109000020?via%3Dihub>
- CoastColour project information:
<https://www.coastcolour.org/index.html>
- ARSO Meteo:
<https://meteo.arso.gov.si/met/en/>
- ALADIN model information:
https://www.umr-cnrm.fr/accord/IMG/pdf/postersi_accord_asw2021.pdf