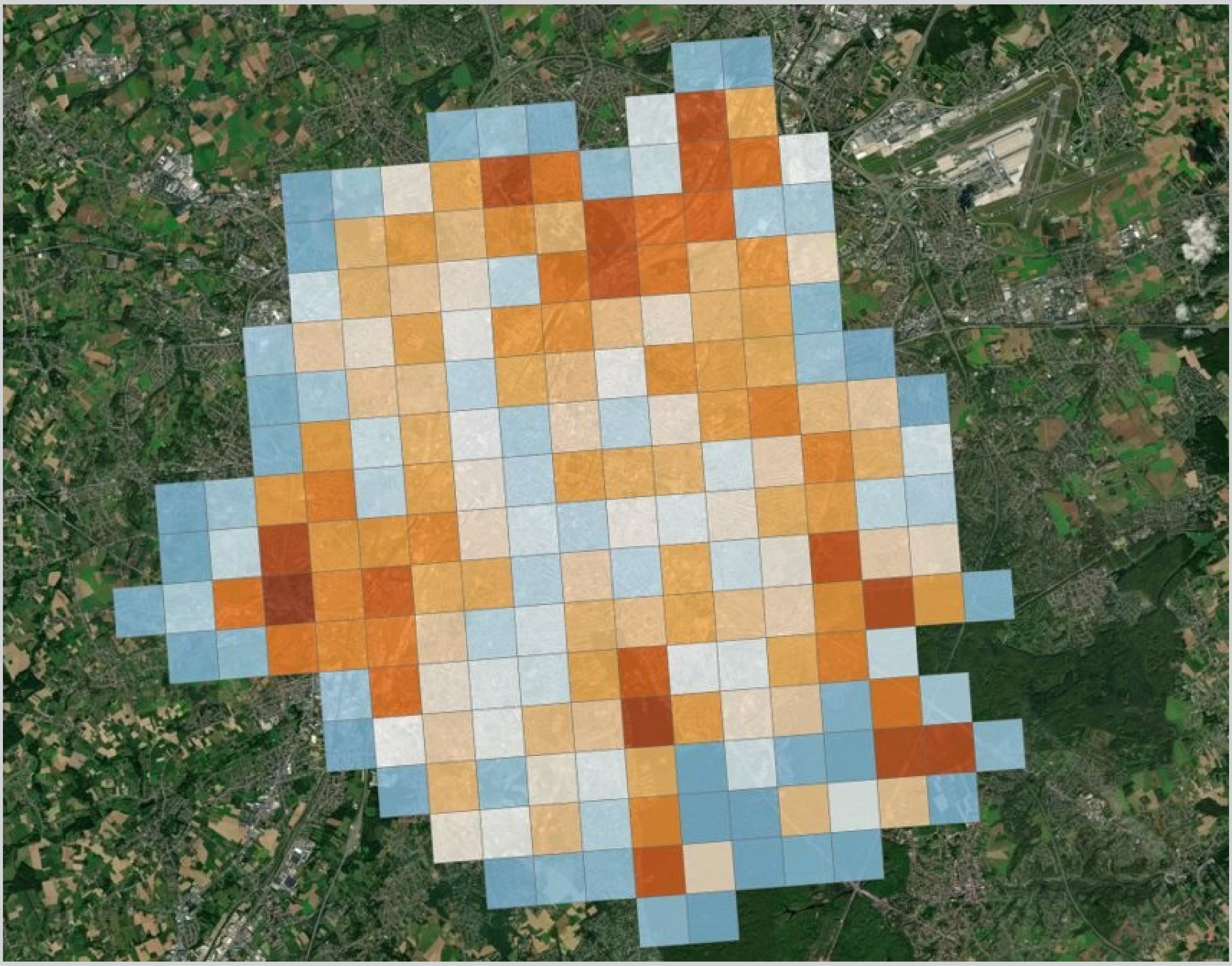
Eionet Report - ETC/ATNI 2021/15

Integrated assessment of noise and air quality in European cities

Methodology

March 2022



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Summary

This report summarises the methodology to derive an index - based on combined noise and air quality data at grid level inside cities. This methodology is based on the scoping study developed by ETC/ATNI in 2020 (Integrated assessment of people exposed to noise and air quality in agglomerations. Eionet-ETC/ATNI Working Paper 2020) where a preliminary analysis of combining the number of people exposed to both harmful levels of noise and average exposure to air pollutant concentrations inside agglomerations was undertaken.

Two indexes were calculated for spatial units of 1 x 1 km. The approach taken to calculate the first index was to take the number of people estimated to be highly annoyed due to noise and the estimated premature deaths due to air pollution in each cell. This information was combined summing the Years Lived with Disability (YLD) from the population suffering road noise high annoyance, and the Years of Life Lost from the premature deaths due to NO_2 or $PM_{2.5}$.

In addition to this, an index showing the combined risk of suffering a premature death due to air pollution and suffering high annoyance due to road traffic noise in each cell was calculated.

A proposal on how to visualise this information at grid cell level has also been discussed and presented as an outcome of this work in the results section.

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1 Introduction

Humans are exposed to a combination of environmental stressors including air pollution, noise, climate-related hazards, water pollution and harmful chemicals. According to Hanninen et al. (2014), noise and air pollution are the main causes contributing to the environmental burden of disease in western Europe. Furthermore, both pollutants affect people's health through different mechanisms (Stansfeld (2015)). For instance, the most prevalent effect of noise is self-reported annoyance and sleep disturbance whilst for air pollution the quantification of health impacts is generally represented with premature deaths from cardiovascular and respiratory diseases.

To date, the EEA environmental indicators have been explored individually or within the same environmental domain (e.g. European Air Quality Index). In the global context, some countries are already moving towards presenting indices based on various environmental domains in combination along with socio-economic factors to support environmental and public health policies (Messer et al. 2014; US EPA, 2019). Maps presenting environmental loads of combined environmental stressors are also available in some European cities (Senate Department for Urban Development and Housing, 2015).

The purpose of this work is to:

- Develop a methodology for building an index that combines the negative health impacts of noise and air pollution in urban areas across the EEA countries.

- Implement a visual communication tool which provides an insight into the spatial variation in environmental health quality from combined noise and air pollution in urban areas across the EEA countries.

The resulting index will provide spatial information on the areas within cities most affected by combined noise and air pollution. This information will build on and contribute to the EEA's integrated assessments and will be used to disseminate information on the European environment to policy makers and to European citizens.

2 Development of a combined index at grid cell level

2.1 Concept

The assessment of the combined exposure to ambient air and noise pollution has several important applications and aims. One is to assess how the two most important environmental pressures affect human health, especially in urban areas where exposure is highest. Another is to inform and support authorities to develop, implement and evaluate mitigation strategies and policies that can simultaneously reduce the pressures and negative impacts from both types of pollution, by choosing measures that maximise co-benefits and reduce trade-offs (ETC/ACM, 2014).

Although noise and air pollution are the main sources of pollution in cities, tools and viewers mapping the combined impacts and risks of these two pollutants are scarce. Generally, noise and air pollution are mapped as independent layers([1]),([2]). Therefore it is difficult to understand which areas are better or worse in terms of combined impacts of noise and air pollution.

([1]) http://www.extrium.co.uk/noiseviewer.html.
([2]) https://www.leefkwaliteitvlaanderen.be/lagen.

The methodology proposed in this paper aims at deriving a combined noise and air pollution index using data that are collected through the EEA reporting mechanism, in fulfilment of European legislation. The index was built using reference European grids of 1 x 1 km and the population associated to those grids.

Noise data was derived from road traffic noise contour maps submitted by countries under the Environmental Noise Directive (END) (EU, 2002) as this is the most prevalent source of noise pollution in cities([3]). Air pollution data is based on annual means for $PM_{2.5}$ and NO_{2}. estimated using a mapping method combining monitoring data from the air quality e-reporting database (EEA, 2020b) with results from the EMEP MSC-W chemical transport model (Simpson et al., 2012) and other supplementary data.

2.2 Previous work

In 2020, preliminary work was undertaken to identify data sources and methodological aspects to be considered for a combined assessment of noise and air pollution. The following methodological decisions were taken as a result of the exploratory work:

- To focus on urban areas for which both air pollution and noise data was available;
- To combine both pollutants using the European grid which is 1 x 1 km because the air quality data is already in this grid resolution;
- To focus on road traffic noise from noise contour maps;
- To focus on annual average in two air pollutants NO_2 and $PM_{2.5}$;
- To produce preliminary maps for 5 cities

Based on that, the first attempt to represent and visualize the combined assessment of both pollutants at cell level inside agglomerations, the number of people exposed to noise levels (L_{den}) above 55 dB and annual mean concentrations of either $PM_{2.5}$ and NO_2 were represented at city level (see Figure 2.1, and Figure 2.2 as examples of the work developed in 2020).

([3]) https://www.eea.europa.eu/ims/exposure-of-europe2019s-population-to.

Figure 2.1: Number of people exposed to noise levels (L_{den}) above 55 dB and population exposure to annual mean $PM_{2.5}$ concentration (unit: µg/m^3) per km^2 in Copenhagen in 2017

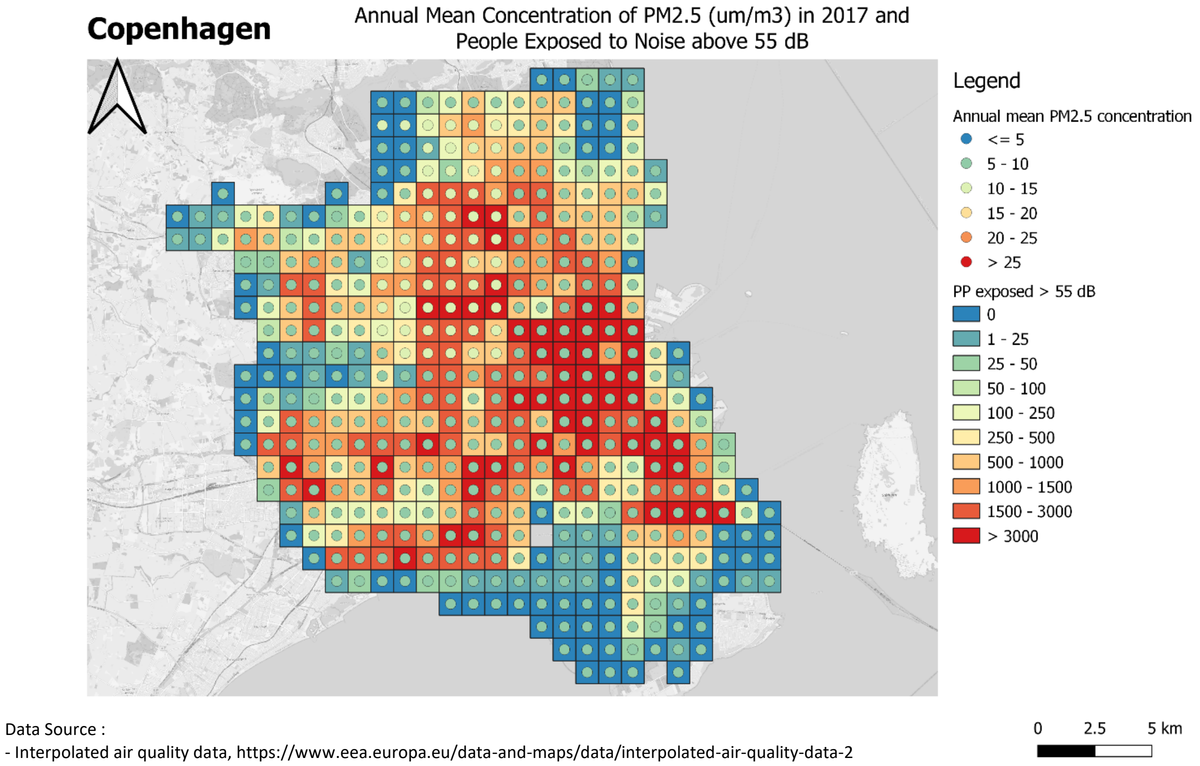
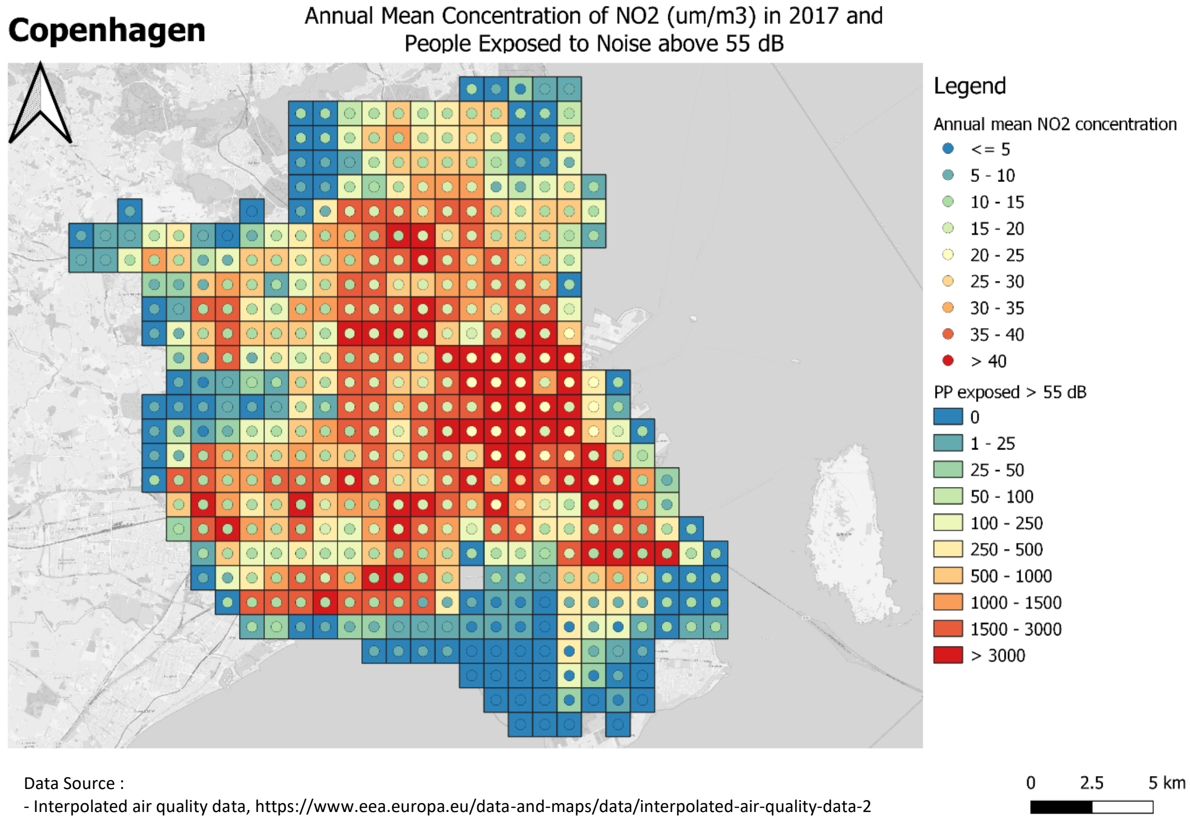


Figure 2.2. Number of people exposed to noise levels (L_{den}) above 55 dB and population exposure to annual mean NO_2 concentration (unit: µg/m^3) per km^2 in Copenhagen in 2017



Similar maps combining both noise and air pollution were developed in 2020, but showing the percentage of the population exposed to noise levels (L_{den}) above 55 dB per 1 x 1 km^2 grid cell and concentrations of $PM_{2.5}$ and NO_2. The outcomes of this combination shows the high dependency of the number of people exposed to noise to the population density in each grid cell, as well as the concentrations of $PM_{2.5}$ and NO_2.

The preliminary work concluded that an index focusing on health impacts and health risks associated with noise and air pollution would be the best approach to combine these two pollutants. This index will then be derived from the assessment of health risks for each environmental pressure factor (i.e., the most relevant air pollution and noise exposure metrics).

3 Input data

3.1 Noise data

Noise data is referred into this paper as noise contour maps for the L_{den} indicator provided by Member States inside END agglomerations (agglomeration as defined in the END shall mean « part of a territory, delimited by the Member State, having a population in excess of 100 000 persons and a population density such that the Member State considers it to be an urbanised area »).

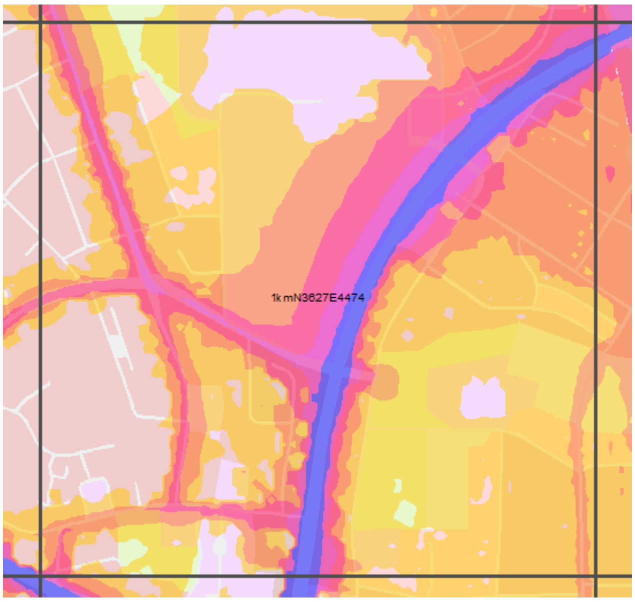
Noise contour maps inside END agglomerations are reported on voluntary basis and addressing the diverse noise sources included in the END. For the development of the combined index at grid cell level, only information on road noise source inside agglomeration is used as this is the most prevalent source of environmental noise inside urban areas.

Five L_{den} noise contour bands due to road traffic noise inside agglomerations are used in this assessment, calculating the percentage of the area that is covered by each of the noise band per grid cell:

- 55-59 dB
- 60-64 dB
- 65-69 dB
- 70-74 dB
- ≥75 dB

The result of this calculation with spatial analysis is the total area of each noise contour band per grid cell (see Figure 3.1).

Figure 3.1: Result of overlaying reference grid cells with road noise contour maps



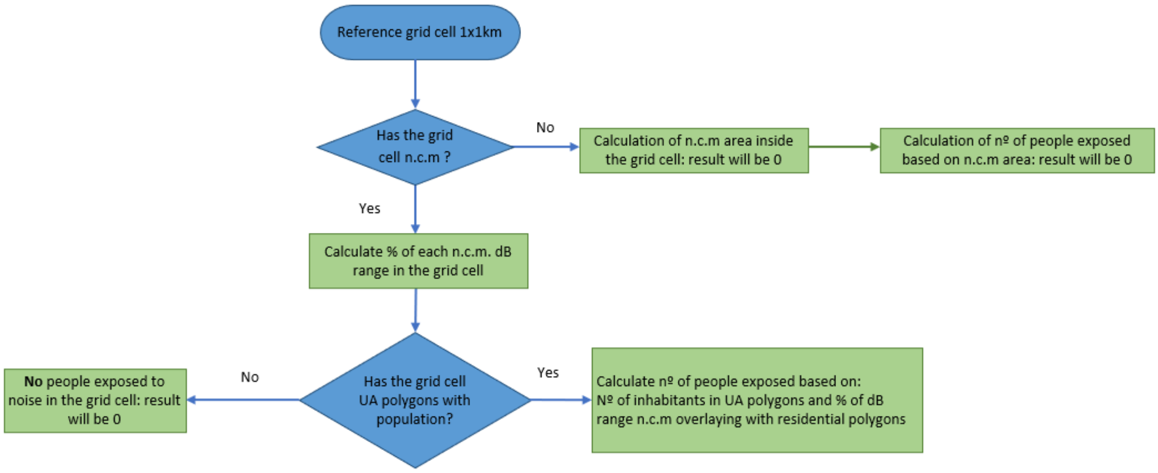
3.1.1 Population data and number of people exposed to the different L_{den} noise bands

Based on the outcomes of the scoping study developed in 2020, the input data that has been chosen to calculate the number of people exposed per grid cell to the different noise bands is the most detailed one at European scale, which integrates the population estimates into every polygon within the Urban Atlas. This is the methodology that provides the best approximation by comparing the results with the data reported by the countries taking into account the five noise bands that are taken into consideration.
The population data being used for this assessment is Urban Atlas 2018 ([4]) with population estimates developed by JRC and integrated into Urban Atlas polygons([5]). This information was available for download on June 2021.

In order to calculate the number of people exposed to the different L_{den} noise bands per grid cell, the workflow detailed in Figure 3.2 has been followed:

([4]) https://land.copernicus.eu/local/urban-atlas/urban-atlas-2018.
([5]) Reference year in EEA38 countries (EU, EFTA, Western Balkans countries, as well as Turkey) and the United Kingdom.

Figure 3.2: Workflow for the noise grid calculation inside agglomeration. Green boxes represent the calculations done and included in the results

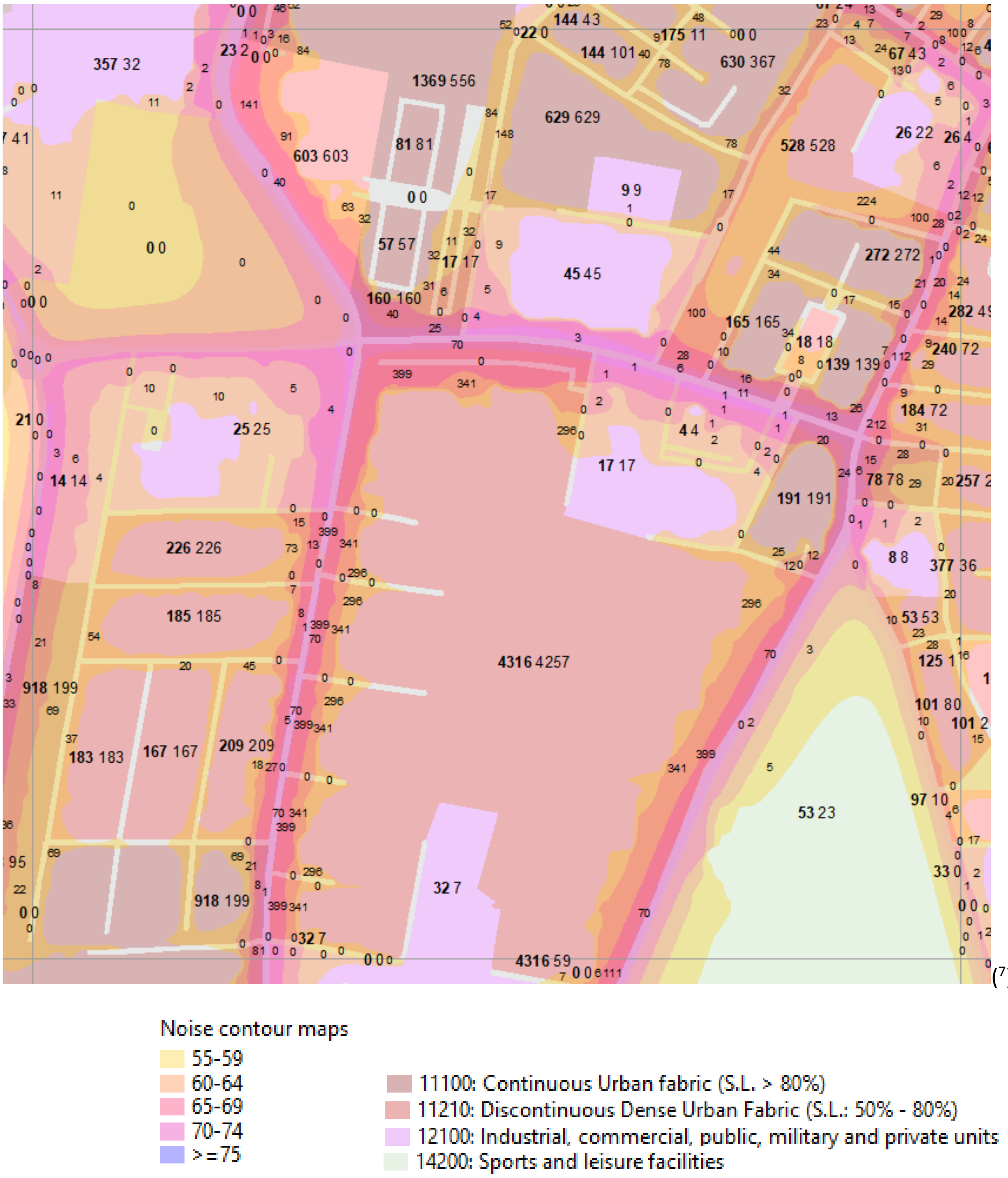


([6])

The result at grid cell level is the estimated number of people exposed to L_{den} road noise per each specific noise band (see Figure 3.3), calculated based on the surface of each Urban Atlas polygon covered by each contour band and assuming that the population is equally distributed along all the Urban Atlas polygon area (and previously distributed into the 1 x 1 km grid cells).

([6]) n.c.m stands for noise contour maps.

Figure 3.3: Result of calculation of the population per noise contour band area



[7]

[7] Bold numbers are the original population sizes inside polygon. Next to the number in bold, there is the number of people after redistributing the total population at polygon level according to the area of the polygon divided by the reference grid cell. The smaller numbers correspond to the redistributed number of estimated population per each noise band in that polygon and grid cell according to the area of the noise contour band in that polygon.

3.1.2 Health risk associated to road traffic noise

In order to calculate the health risks associated with road traffic noise we use the area covered by different noise levels in a grid cell. The area percentage of each noise middle band is multiplied by the probability of suffering high annoyance using the following formula:

Noise risk HA = ∑ proportion area covered$_i$ by *[(78.927 - 3.1162 x L_{den} mid band + 0.0342 x L_{den} mid band ^{2}) /100] (3.1)

where *i* is : 55-59 ; 60-64, 65-69 ; 70-74 ; equal or above 75

3.1.3 Total health impacts associated to road traffic noise

In order to calculate the total health impacts of noise in a cell we use the population exposed in each noise band as described in 3.1.1. The number of people exposed to each noise band is used to calculate the Years Lived with Disability (YLD) caused by high annoyance (HA) due to road noise using the following formula :

$YLD_{cell,\ road\ noise,}$ = Total HA * Disability Weight Annoyance (3.2)

Where:
Total HA = ∑ Number HA per each band (according to WHO Europe(2018)) (3.3)

Where:
Number HA = [(78.927 - 3.1162 x L_{den} mid band + 0.00342 x L_{den} mid band ^{2}) /100] * Number of people in Band * Fraction adult population in country (3.4)

Disability Weight Annoyance = 0,02 (according to WHO Europe (2018) and WHO Europe and JRC (2011))

3.2 Air quality

To estimate health endpoints due to exposure to air pollution, concentration maps with annual statistics of the relevant pollutant metric are produced on a 1*1 km^2 grid resolution for the whole Europe. The annual statistics are estimated using a mapping method ('Regression – Interpolation – Merging Mapping') that combines the monitoring data from rural, urban/suburban background and urban/suburban traffic stations for $PM_{2.5}$ and NO_2 with results from the EMEP chemical transport model and other supplementary data, such as altitude, satellite data, meteorology, land cover and population density (ETC/ATNI, 2020a) using linear regression model followed by kriging of its residuals. For NO_2, and since 2017 maps also for $PM_{2.5}$, urban traffic station data was also included to take into account hotspots, since traffic is the most important source of NO_2 and an important source of PM. In this methodology, separate rural, urban background and urban traffic map layers are created separately and subsequently merged into the final map. The mapping layers are constructed according to the equation :

$$\hat{Z}(s_0) = c + a_1 X_1(s_0) + a_2 X_2(s_0) + \cdots + a_n X_n(s_0) + \hat{\eta}(s_0) \quad (3.5)$$

where $\hat{Z}(s_0)$ is the estimated value of the air pollution indicator at the point s_o,
$X_1(s_0), X_2(s_0), \ldots, X_n(s_0)$ are *n* number of individual supplementary variables at the point s_o
$c, a_1, a_2, \ldots, a_n$ are *n+1* parameters of the linear regression model calculated based on the data at the points of measurement,

$\hat{\eta}(s_0)$ is the spatial interpolation of the residuals of the linear regression model at the point s_o calculated based on the residuals at the points of measurement.

For different pollutants and map layers (rural, urban background, urban traffic), different supplementary data are used, depending on their improvement to the fit of the regression. The spatial interpolation of the regression's residuals is carried out using ordinary kriging, according to

$$\hat{\eta}(s_i) = \sum_{i=1}^{N} \lambda_i \eta(s_i), \ \sum_{i=1}^{N} \lambda_i = 1 \quad (3.6)$$

where $\eta(s_i)$ are the residuals of the linear regression model at N points of measurement s_i, $i = 1, \ldots, N$,

$\lambda_1, \ldots, \lambda_N$ are the estimated weights based on the variogram, which is a measure of a spatial correlation, see Cressie (1993).

For $PM_{2.5}$, both measurement data and the estimated data from so-called pseudo stations (i.e., estimates at the locations of PM_{10} stations with no $PM_{2.5}$ measurement, based on PM_{10} measurements) are used. For $PM_{2.5}$, a logarithmic transformation to measurement and modelling is performed prior to linear regression and interpolation. After interpolation, a back-transformation is performed.

The separate map layers are merged into one combined final map according to the equation

$$\hat{Z}_F(s_0) = \big(1 - w_U(s_0)\big)\hat{Z}_R(s_0) + w_U(s_0)\big(1 - w_T(s_0)\big)\hat{Z}_{UB}(s_0) + w_U(s_0) w_T(s_0) \hat{Z}_{UT}(s_0) \quad (3.7)$$

where $\hat{Z}_F(s_0)$ is the resulting estimated concentration in a grid cell s_o for the final map,

$\hat{Z}_R(s_0), \hat{Z}_{UB}(s_0)$ *and* $\hat{Z}_{Ut}(s_0)$ is the estimated concentration in a grid cell s_o for the rural, the urban background and the urban traffic map layer, respectively,

$w_U(s_0)$ is the weight representing the ratio of the urban character of the grid cell s_o.,

$w_T(s_0)$ is the weight representing the ratio of areas exposed to traffic air quality in a grid cell s_o.

The primary input are the air quality monitoring data, as extracted from the official EEA Air Quality e-Reporting database, EEA (2021). This data set is supplemented with several EMEP rural stations from the database EBAS (NILU, 2021) not reported to the Air Quality e-Reporting database. Only data from stations classified as background (for the three types of area, rural, suburban and urban) and traffic (for the two types of area, rural and suburban). Industrial and rural traffic stations are not considered; they represent local scale concentration levels and cannot be easily generalized for the whole area.

Next to the measurement data, different supplementary data are used for the air quality mapping, most importantly the chemical transport model. Namely, we use the EMEP MSC-W model, which is an Eulerian model (Simpson et al., 2012). Other supplementary data consist of: the meteorological data as extracted from the reanalysed data sets ERA5 and ERA5-Land coming from the Climate Data Store (ECMWF, 2021), namely wind speed and surface solar radiation; altitude coming from the Global Multi-resolution Terrain Elevation Data 2010 (GMTED2010); population density, based on Geostat 2011 grid dataset (Eurostat, 2014), which is supplemented by the alternative sources (JRC, ORNL) in limited areas not covered by the Geostat data; GRIP road type data (Meijer et al., 2018). For NO_2 mapping, satellite data coming from OMNO2 (NASA, 2020) and CLC2018 land cover data (EC, 2020) are also used.

For details on the methodology and input data to obtain annual statistics on concentration maps and overall uncertainty related to the estimated data, the readers are referred to ETC/ATNI (2020a), and references therein. A caveat for the concentration maps is the exclusion of overseas territories such as Madeira, Azores, Canary Islands, French Guiana, Guadeloupe, Martinique, Mayotte and Réunion.

In this report, the final merged maps in 1 x 1 km^2 grid resolution are used as input data.

3.2.1 Population data and health demographics

The population density map used for estimating of health risk to air pollution is based on the GEOSTAT 2011 dataset (Eurostat, 2014). This data is available on the same grid resolution as the ambient air concentrations and was scaled with the total population data available country-wise from Eurostat (Eurostat, 2021a) to map the population distribution for 2017. The Eurostat data reflects the total population on the 31^{st} of December of the indicated year reported by the National Statistical Offices. Some population adjustments need to be made as French, Portuguese and Spanish overseas territories are not included in the mapping domain, and GEOSTAT 2011 Cyprus population data includes both Greek Cypriots and Turkish Cypriots; the Eurostat data includes only Greek Cypriots. The procedures for scaling and data adjustments are described in ETC/ATNI (2020b).

Eurostat data on cause of death (Eurostat, 2021b) is available since 2011 for 5-year interval, from less than 1 year to '95 years or over'. It is compiled based on the ICD10 Mortality Tabulation List, the latest tabulation existing for mortality data. For the health outcomes, and according to the description of the concentration-response functions (CRFs, Table 3.1), only natural deaths should be considered. Therefore, causes of death due to injury or poisoning (V01-Y89) and unknown and unspecified causes (R00-R99) as well as total deaths due to all causes, are excluded before calculations. Estimation of natural deaths with 1-year interval is based on interpolation using ratio between all natural deaths and all causes deaths (5-year interval) and Eurostat data on total number of deaths (Eurostat, 2021c) given with 1-year interval. After this operation, mortality data is aligned with life expectancy data, available from Eurostat database (Eurostat, 2021d) on a 1-year interval, by age and sex, from 0 to 85+ years old, since 1960. To reflect all age groups available for mortality data (up to 95+), life expectancies are extrapolated for ages above 85, using regression on life expectancy data for age groups 79 – 85. Demographic data for some European countries might be missing. To gap-fill the demographic data, data from a neighbouring country with similar social-economical characteristics are used as a proxy. The procedures gap-filling are described in ETC/ATNI (2020b).

3.2.2 Concentration response functions and counterfactual concentrations

The CRFs recommended by the WHO in their HRAPIE project report (WHO, 2013) were applied for the health risk assessment estimated here. The HRAPIE recommendations group the effects according to the uncertainty related to the CRF and the availability of the baseline health data. A group is labelled with an A if enough data are available for quantification of the effects; a group is labelled with a B if there is more uncertainty when quantifying the same effects. Further, HRAPIE marked the pollutant-outcome pairs contributing to the total effect, i.e. it is assumed that their effects are additive, with an asterisk (*). All CRFs applied in this study describe the effect of long-term exposure on total all-cause (natural) mortality. The HRAPIE report also states that recommendations provided for CRFs are given as a relative risk (RR) for an increase of 10 $\mu g/m^3$, where it is assumed that the concentration changes are relatively low.

Table 3.1 shows the recommended RR for mortality with 95 % confidence interval (CI), including the baseline concentration taken into consideration when calculating the health outcomes for each air pollutant and the age of the population affected. The counterfactual concentration (C_0) is also presented in Table 3.1 for $PM_{2.5}$ and NO_2 annual means. Note that relative risk estimations due to exposure to ambient air concentration levels in 2017 take the central value of the confidence interval for the recommended CRFs into account.

Table 3.1: Risk ratios (RR) linking exposure to $PM_{2.5}$ and NO_2 mortality, their associated 95 % confidence interval (CI) and baseline concentrations (modified from WHO, 2013)

Pollutant	RR (95 % CI) per 10 µg/m^3	Health outcome	Grouping of effects
$PM_{2.5}$	1.062 (1.040 – 1.083) C_0 = 0 µg/m^3	All-cause (natural) mortality in ages above 30 (ICD-10 codes A00-R99).	A*
NO_2	1.055 (1.031 - 1.08) C_0 = 20 µg/m^3	All-cause (natural) mortality in ages above 30 (ICD-10 codes A00-R99).	B*

* Denotes additionality of effects of the pollutant when more pollutants are consiered.

3.2.3 Risk associated to air pollution exposure

A health risk assessment requires information on the risk function (CRF), the pollution concentrations for the exposed population, and the baseline frequency of the health outcome. The risk function relates concentration to risk of death or disease, and it is typically based on relative risk estimates provided by epidemiological studies. In epidemiological terms, the relative risk indicates the likelihood of an exposed group to experience a health outcome relative to a group that is not exposed. In practical terms, the relative risk is the change in the incidence of the health outcome per unit of concentration for those at risk. Thus, an RR of 1.00 implies that the risk is identical in the exposed and not exposed groups. If RR is greater than 1.00 then the risk is increased in the exposed group. The risk of exposure to air pollution in a population is typically estimated by an average concentration level. For European air pollution levels, the relative risk in a population whose exposure is estimated by an average concentration can be described as a log-linear function (Ostro, 2004) and specified as follows:

$$RR_C = \exp\left[\,\beta\,(C - C_0)\,\right] \qquad (3.8)$$

where, C is the concentration level the population is exposed to, C_0 the baseline concentration, and β is the concentration-response factor. C_0 can either be the background concentration (i.e., the level that would exist without any human-made pollution), a concentration below which no health effects are expected, or a counterfactual concentration level. β can be estimated based on a CRF described in Table 3.1. The details of the estimation can be found in ETC/ATNI (2020b).

3.2.4 Total health impacts associated to air pollution exposure

The impact on mortality attributable to exposure to air pollution in this is based in one mortality endpoint: years of life lost (YLL). These are the years of potential life lost as a result of premature deaths. It is an estimate of the average number of years that a person would have lived if they had not died prematurely. These are calculated based on the mortality and life expectancy data:

$$YLL = PAF\ \textstyle\sum_{a,s} CDR_{a,s} * Pop_{a,s} * LE_{a,s} \qquad (3.9)$$

Where PAF *is* the population attributable fraction, $CDR_{a,s}$ is the crude death rate by sex (s) and age (a) in a particular population due to a specific cause, $Pop_{a,s}$ is the population fraction stratified by age and sex, and $LE_{a,s}$ is the average time a person is expected to live, based on the year of their birth, sex (s) and age (a). The details of the estimation can be found in ETC/ATNI (2020b).

4 Mapping combined risks and impacts of road traffic noise and air pollution

Two indexes were calculated for spatial units of 1 x 1 km inside agglomerations. The first index shows the combined risk of suffering a premature death due to air pollution and suffering high annoyance due to road traffic noise. The approach taken to calculate the second index was to take the number of people estimated to be highly annoyed due to noise and the estimated premature deaths due to air pollution in each cell. This information was combined summing the Years Lived with Disability (YLD) from the population suffering road noise high annoyance, and the Years of Life Lost from the premature deaths due to NO_2 or $PM_{2.5}$.

The two indexes were produced for different combinations of pollutants:

- Road traffic noise + NO_2 annual concentrations
- Road traffic noise + $PM_{2.5}$ annual concentrations

4.1 Index 1 – Health risk due to noise and air pollution

The index on health risk due to road noise and air pollution is estimated by summing of the risk of suffering a premature death due to the levels of $PM_{2.5}$ or NO_2 and the risk of suffering high annoyance due to road noise levels in a given grid-cell. This index it is aimed at citizens wanting to assess the environmental quality of their neighbourhoods and can be used to identify which areas are unhealthy.

The content of each cell is the result of the following formula:

$$HealthRisk_{cell} = 0{,}02 * (\text{Noise risk HA}) + 1 * (\text{RR air} - 1) \qquad (4.1)$$

Where:

- *RRair* is the relative risk related to exposure to $PM_{2.5}$ or NO_2 (see 3.2.3)
- *Noise risk HA* is the relative risk associated to suffer high annoyance due to road noise in that grid cell (see 0).

4.2 Index 2 - Total health impacts due to noise and air pollution

The index on total health impacts due to noise and air pollution is estimated based on the sum of the YLD caused due to high annoyance (HA) from road traffic noise, and the YLL due to NO_2 or $PM_{2.5}$ premature deaths. This index takes into account the total population of the grid-cell. It can be used to identify areas where most population is impacted and it is oriented to help stakeholders to identify areas where measures would benefit the largest number of people.

The content of each cell is the result of the following formula:

$$DALYs_{cell} = YLL_{cell}\ (\text{years of life lost due to air pollution}) + YLD_{cell}\ (\text{high annoyance due to road traffic noise}) \qquad (4.2)$$

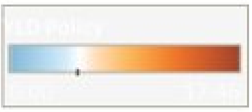
Where:

- $YLL_{cell,\ NO2/PM2.5}$ (see 3.2.3)
- $YLD_{cell,\ road\ noise}$ (see 0)

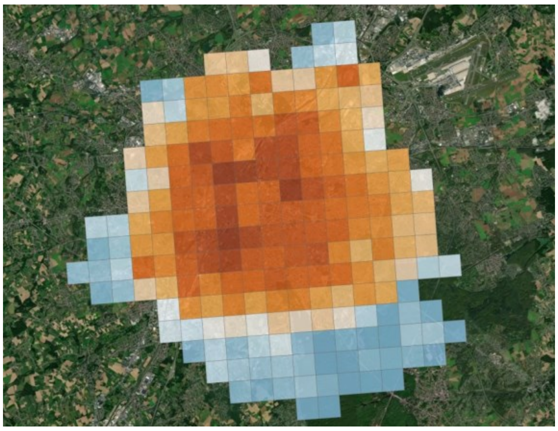
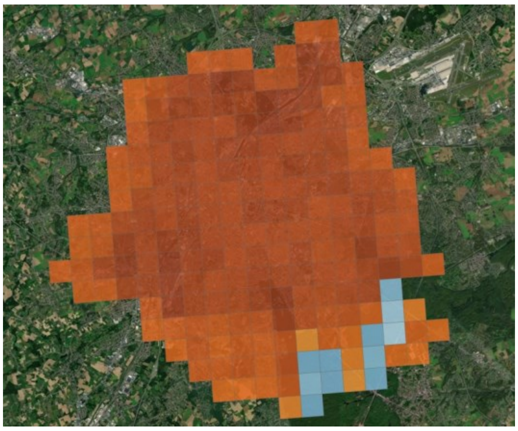
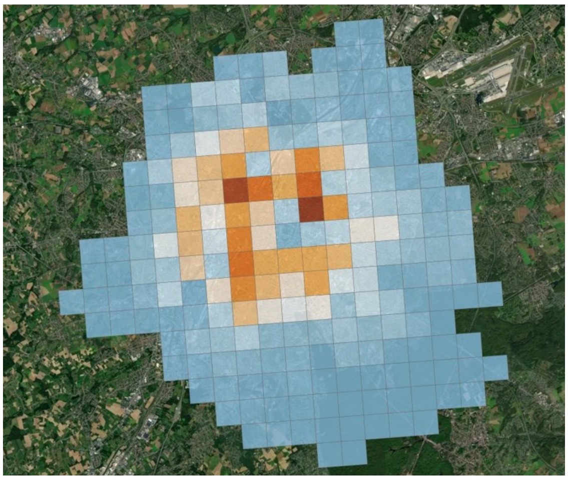
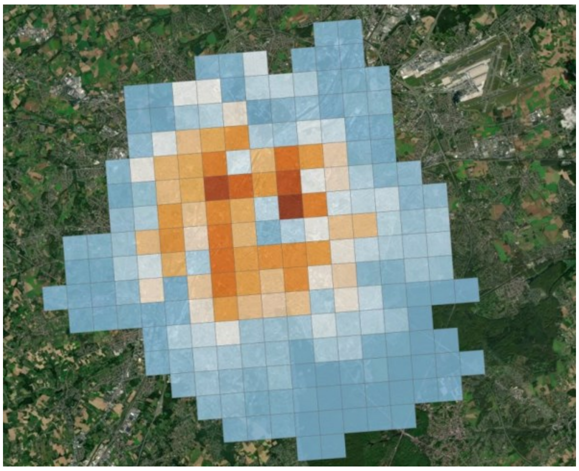
Although this index is based on the DALYs formula, the representation of the values are not meant to be interpreted as DALY values. Therefore the results are only used to create a continuous range of values to represent high and low impacts.

5 Results

The maps showing combined risks and impacts due to road traffic noise and air pollution at cell level were calculated for 150 cities where information on road noise contour maps was available, considering combination with both NO_2 and $PM_{2.5}$. Examples of the combined risks and health impacts of noise and air pollution in urban areas are shown below and are represented by using the following colour scale (low to high risks/impacts):



Low High

Results for Index 1 – Health risk due to road noise and air pollution	
Results for road traffic noise and NO_2	Results for road traffic noise and $PM_{2.5}$
	
Results for Index 2: Total health impacts due to road noise and air pollution	
Results for road traffic noise and NO_2	Results for road traffic noise and $PM_{2.5}$
	

6 Next steps

The resulting indices provide spatial information on the areas most affected combining noise and air pollution across European urban areas. This information can build on and contribute to the EEA's integrated assessments and it is going to be used to disseminate information on the European environment to policy makers and to European citizens.

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