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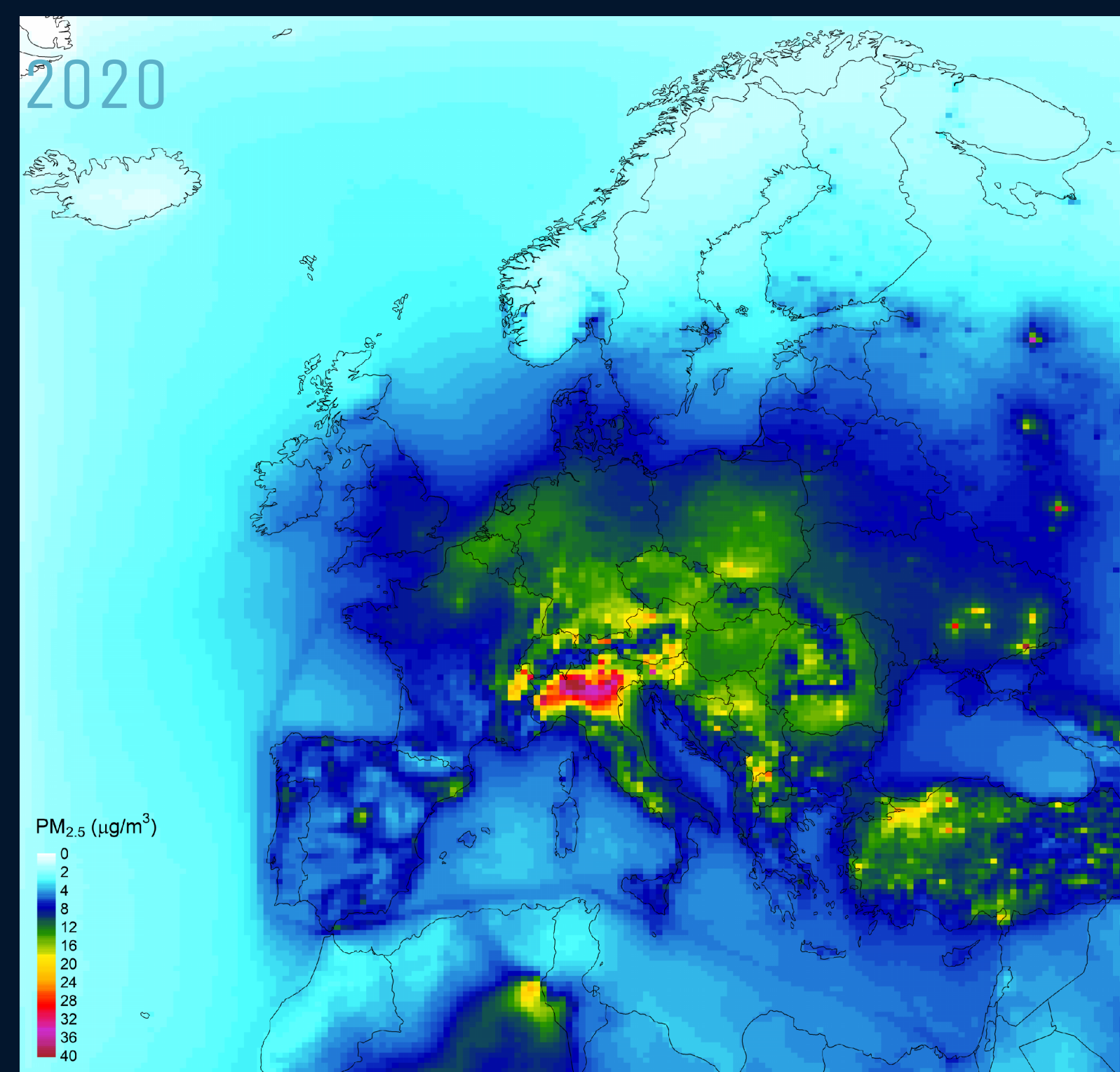
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AIR POLLUTION & HEALTH

TNO innovation
for life

DETERMINING RISK FROM AIR POLLUTION USING HIGH RESOLUTION POPULATION AND CONCENTRATION DATA

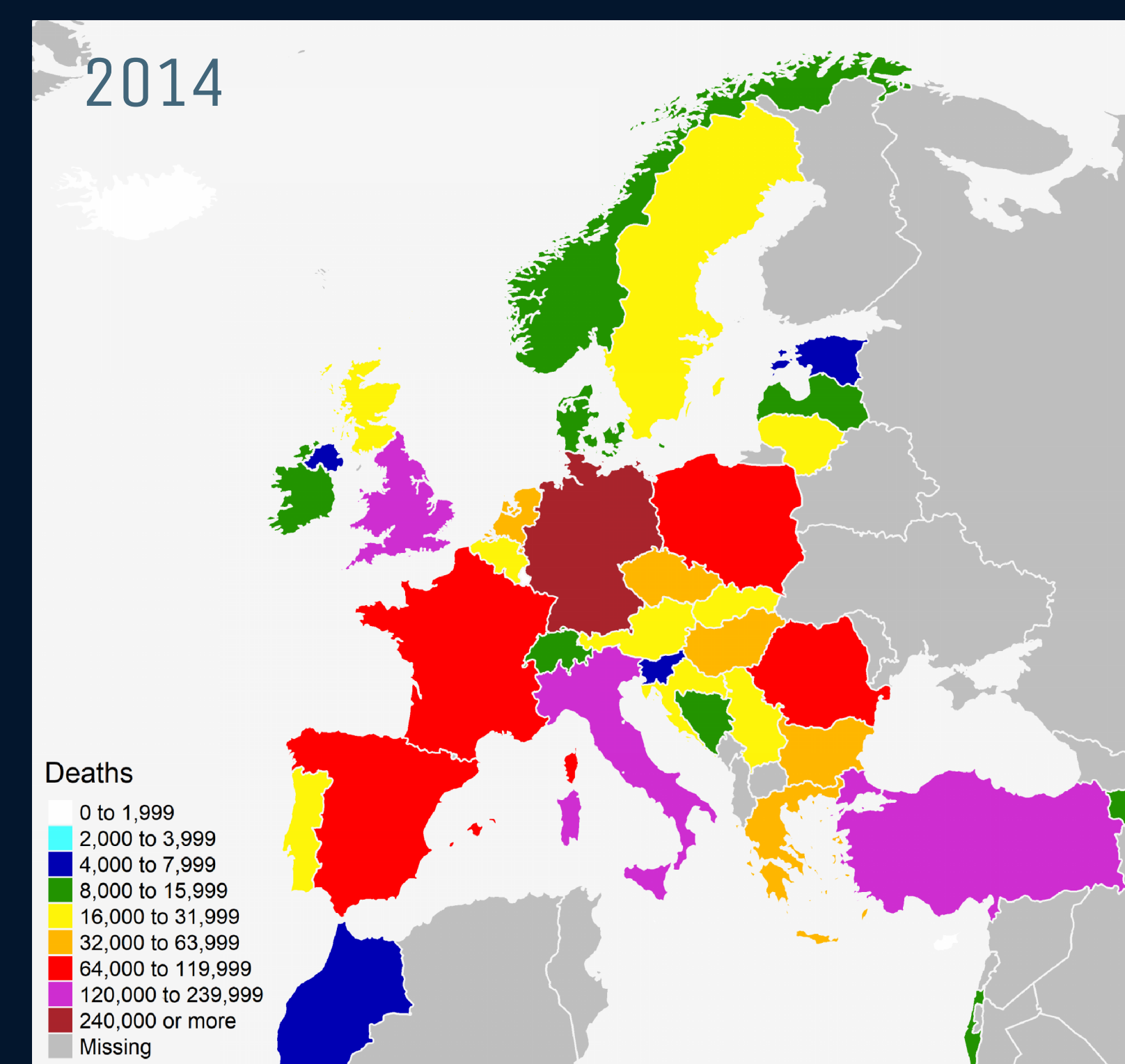
13th International Conference on Air Quality – Science and Application, Thessaloniki, Greece, 27th June - 1st July 2022



Source: TOPAS a product based on the chemical transport model LOTOS-EUROS <https://topas.tno.nl>



Source: Rose, A., McKee, J., Sims, K., Bright, E., Reith, A., & Urban, M. (2021). LandScan Global 2020 [Data set]. Oak Ridge National Laboratory. <https://doi.org/10.48690/1523378>



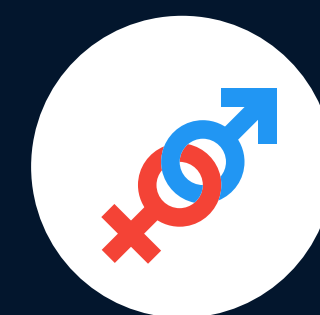
Source: World Health Organisation (WHO) mortality database <https://www.who.int/data/data-collection-tools/who-mortality-database>



CONCENTRATIONS

Using the LOTOS EUROS chemistry transport model, pollutant concentrations are available at high spatial and temporal resolution across Europe. Annual Average **PM2.5** concentrations are shown at 25km resolution in the above plot. LOTOS EUROS is equipped with source apportionment capabilities (called TOPAS, topas.tno.nl) that make it possible to track the origin of pollutants in the atmosphere both in terms of source sector and country origin.

Additionally in Eindhoven, concentrations from this model are assimilated with ground based measurement sites, using a Ensemble Transform Kalman Filter (EnKF) to reduce the bias error and improve spatial resolution to 1km. This work has been carried out as part of the Exposense project



POPULATION

The image above shows estimated **population** data at 1km resolution for 2020, retrieved from Landsat. For the Netherlands, Postcode level population is available, and in Eindhoven, as part of the Exposense project, **Zicht Op Data** and **Resono** are able to provide estimates from mobile smart phones of approximately 13% of the Dutch population for the number of persons in any pre defined 'area' using a propriety algorithm called 'hyperfencing'.



MORTALITY

Annual Mortality data from the World Health Organisation (WHO), is available for each year by ICD10 code, age and sex for 170 countries as far back as 2010.

The plot above shows total mortality from Ischemic Heart Disease (IHD), Lower Respiratory Infections (LRI), Stroke, Chronic Obstructive Pulmonary Disease (COPD) and Lung Cancer (LC) for 2014.

In the Netherlands the Central Bureau of Statistics (CBS) has the same data at more detailed spatial and temporal resolution.