# Adaptive Capacity (Vulnerability Sub-Indices)

Data Dictionary

Adaptive capacity is a component of vulnerability index framework developed in 2007 by the Intergovernmental Panel on Climate Change (IPCC). Adaptive capacity is designed to capture the capabilities of a household, community, or population to cope with or recover from the impact of various exposures. In phase 1 of AusEnHealth, adaptive capacity has been considered against three separate exposures: extreme heat, extreme cold, and air pollution.

This document defines the variables used in adaptive capacity sub-indices, a crucial component in the creation of AusEnHealth’s vulnerability indices. For more information, please see the AusEnHealth Methods Report, hosted at <https://frontiersi.com.au/ausenhealth-digital-twin/>.

## Climate (Extreme Heat, Extreme Cold)

Variables Specific to Climate

| **Variable** | **Description and Derivation** |
| --- | --- |
| WB | Percentage of region comprised of water, otherwise briefly described as waterbody (WB) percentage. |
|  | This variable is derived from the Digital Earth Australia (DEA) Waterbodies data product, publicly available from Geoscience Australia’s Landsat Collection 2. Satellite data and polygons of Australian Statistical Geography Standard (ASGS) regions have been input into GIS software to determine the percentage of each geographical region that contains water. |
| rsWB | A spatial percentile ranking of the WB variable, in ascending order from lowest to highest. |
|  | For derivation, see the Spatial Ranking section at the bottom of the document. |

## Air Quality

Variables Specific to Air Pollution

*There are no variables utilised only in the air quality adaptive capacity sub-index.*

## Common

Variables Utilised in Both Climate and Air Quality Adaptive Capacity Sub-Indices

| **Variable** | **Description and Derivation** |
| --- | --- |
| NV | Percentage of households which own no motor vehicles. |
|  | This variable is shared directly from the Australian Bureau of Statistics (ABS) 2016 Census, from the Number of Motor Vehicles by Dwelling Records. |
| rsNV | A spatial percentile ranking of the NV variable, in ascending order from lowest to highest. |
|  | For derivation, see the Spatial Ranking section at the bottom of the document. |
| INT | Percentage of households with access to internet. |
|  | This variable is shared directly from the Australian Bureau of Statistics (ABS) Data by Region Catalogue. Specifically, this variable has been accessed from the Family and Community dataset. |
| rsINT | A spatial percentile ranking of the INT variable, in ascending order from lowest to highest. |
|  | For derivation, see the Spatial Ranking section at the bottom of the document. |
| HOSP | Number of hospitals, per 1000 population. |
|  | This variable is derived from the Commonwealth Declared Hospitals dataset, provided by health.gov. Hospital counts by postcode were taken from this dataset and used in conjunction with Census of Population and Housing Mesh Block Counts in the calculation of this variable. |
| rsHOSP | A spatial percentile ranking of the HOSP variable, in ascending order from lowest to highest. |
|  | For derivation, see the Spatial Ranking section at the bottom of the document. |
| GS | Percentage of land use declared as parkland. Otherwise referred to as green space (GS). |
|  | This variable is derived from the Australian Statistical Geography Standard (ASGS) mesh block data provided by the Australian Bureau of Statistics (ABS). The total count of land use declared as parkland in each aggregated region are divided by the total number of mesh blocks per region to calculate this variable. |
| rsGS | A spatial percentile ranking of the GS variable, in ascending order from lowest to highest. |
|  | For derivation, see the Spatial Ranking section at the bottom of the document. |
| VI | Normalized difference vegetation index (NDVI). Otherwise referred to as vegetation index (VI). |
|  | This parameter was publicly accessed from NASA’s MODIS Vegetation Index Products (NDVI and EVI) datasets. These indices are created using daily, atmosphere-corrected, bidirectional surface reflectance from satellite data. |
| rsVI | A spatial percentile ranking of the VI variable, in ascending order from lowest to highest. |
|  | For derivation, see the Spatial Ranking section at the bottom of the document. |

## Spatial Ranking

Methodology Applied to all Spatially Ranked Variables

A number of variables are converted to spatially ranked percentiles for use in the creation of overall vulnerability indices. As this method is frequently applied, a small summary of the method is given below.

Spatially ranked percentiles are created in AusEnHealth by taking national data for a variable at a specific time, and using Rstudio’s frank function to produce, in ascending order, indexed spatial ranks. Arguments are selected in the frank function to continue recording missing values (na.last = "keep"), and to set ties as the minimum rank of the set of tied values (ties.method = c("min")). The result is then divided by the number of regions to produce a percentile ranking, which provides a consistent scale from 0 to 1 for index creation.

A spatial percentile represents how high or low that variable is compared to the rest of Australia at that time. For example, if a region’s temperature spatial percentile is 1 in January 2011, that means that region is the hottest in Australia for the month of January 2011.