



*Supplement of*

## **Increasing water stress in Chile revealed by novel datasets of water availability, land use and water use**

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**Table S1.** List of Earth System Models used from CMIP6. Downscaled variables include precipitation (P) and daily minimum/maximum temperatures ( $T_N$ ,  $T_X$ ) in a subset of models, depending on data availability at the time of the analysis.

| Model         | Institution                                                                                       | Reference               | Downscaled and derived variables   |
|---------------|---------------------------------------------------------------------------------------------------|-------------------------|------------------------------------|
| ACCESS-CM2    | Commonwealth Scientific and Industrial Research Organisation and Bureau of Meteorology, Australia | Bi et al. (2020)        | P                                  |
| ACCESS-ESM1-5 |                                                                                                   | Ziehn et al. (2020)     | P, $T_N$ , $T_X$ , $ET_0$ , $ET_N$ |
| BCC-CSM2-MR   | Beijing Climate Center, China                                                                     | Wu et al. (2019)        | P, $T_N$ , $T_X$ , $ET_0$ , $ET_N$ |
| CanESM5       | Canadian Centre for Climate Modelling and Analysis, Canada                                        | Swart et al. (2019)     | P, $T_N$ , $T_X$ , $ET_0$ , $ET_N$ |
| CMCC-ESM2     | Centro Euro-Mediterraneo sui Cambiamenti Climatici, Italy                                         | Cherchi et al. (2019)   | P                                  |
| CNRM-CM6-1    | Météo-France/Centre National de Recherches Météorologiques, France                                | Voltaire et al. (2019)  | P                                  |
| CNRM-ESM2-1   |                                                                                                   | Séférian et al. (2019)  | P                                  |
| EC-Earth3     | EC-Earth consortium, Europe                                                                       | Döscher et al. (2021)   | P, $T_N$ , $T_X$ , $ET_0$ , $ET_N$ |
| FGOALS-g3     | Chinese Academy of Sciences, China                                                                | Li et al. (2020)        | P                                  |
| GFDL-ESM4     | Geophysical Fluid Dynamics Laboratory, USA                                                        | Dunne et al. (2020)     | P, $T_N$ , $T_X$ , $ET_0$ , $ET_N$ |
| IPSL-CM6A-LR  | Institut Pierre-Simon Laplace, France                                                             | Boucher et al. (2020)   | P, $T_N$ , $T_X$ , $ET_0$ , $ET_N$ |
| MIROC6        | Japan Agency for Marine-Earth Science and Technology, Japan                                       | Tatebe et al. (2019)    | P, $T_N$ , $T_X$ , $ET_0$ , $ET_N$ |
| MPI-ESM1-2-HR | Max Planck Institute for Meteorology, Germany                                                     | Mauritsen et al. (2019) | P, $T_N$ , $T_X$ , $ET_0$ , $ET_N$ |
| MRI-ESM2-0    | Meteorological Research Institute, Japan                                                          | Yukimoto et al. (2019)  | P, $T_N$ , $T_X$ , $ET_0$ , $ET_N$ |
| NorESM2-MM    | Norwegian Climate Centre, Norway                                                                  | Seland et al. (2020)    | P, $T_N$ , $T_X$ , $ET_0$ , $ET_N$ |
| TaiESM1       | Research Center for Environmental Changes, Taiwan, China                                          | Lee et al. (2020)       | P, $T_N$ , $T_X$ , $ET_0$ , $ET_N$ |
| UKESM1-0-LL   | Met Office Hadley Centre, United Kingdom                                                          | Sellar et al. (2019)    | P                                  |

**Table S2.** CR2LUC classes and parameters used for ET simulations.

| Level 1                 | Level 2                  | Level 3      | $\beta_X$ (1) | $d_R$ (mm) | $w_{IX}$ (mm) | $f_{IWB}$ (1) |
|-------------------------|--------------------------|--------------|---------------|------------|---------------|---------------|
| (100) Agricultural Land | (110) Cereals            | (111) Wheat  | 1.15          | 1300       | 1.00          | 1             |
|                         |                          | (112) Maize  | 1.20          | 1300       | 1.00          | 1             |
|                         |                          | (113) Oat    | 1.05          | 1250       | 1.00          | 1             |
|                         |                          | (114) Rice   | 1.20          | 750        | 0.50          | 1             |
|                         |                          | (115) Barley | 1.15          | 1250       | 0.80          | 1             |
|                         |                          | (116) Other  | 1.15          | 1200       | 1.00          | 1             |
|                         | (120) Legumes and Tubers | (121) Potato | 1.15          | 500        | 0.80          | 1             |
|                         |                          | (122) Other  | 1.15          | 500        | 0.80          | 1             |
|                         | (130) Industrial Crops   |              | 1.15          | 1250       | 0.80          | 1             |

|                                    |                                       |                                     |      |      |      |   |
|------------------------------------|---------------------------------------|-------------------------------------|------|------|------|---|
|                                    | (140) Vegetables and Flowers          | (141) Vegetables                    | 1.05 | 500  | 0.50 | 1 |
|                                    |                                       | (142) Flowers                       | 1.00 | 500  | 0.50 | 1 |
|                                    | (150) Forage Crops and Meadows        | (151) Annual                        | 1.15 | 1200 | 1.00 | 1 |
|                                    |                                       | (152) Permanent                     | 1.15 | 1500 | 1.00 | 1 |
|                                    | (160) Orchards                        | (161) Table Grapevine               | 0.85 | 1500 | 0.75 | 1 |
|                                    |                                       | (162) Prunus                        | 0.95 | 1500 | 1.00 | 1 |
|                                    |                                       | (163) Pomes                         | 0.95 | 1500 | 0.90 | 1 |
|                                    |                                       | (164) Avocado                       | 0.85 | 1250 | 0.90 | 1 |
|                                    |                                       | (165) Citrus                        | 0.80 | 1200 | 0.70 | 1 |
|                                    |                                       | (166) Walnut Tree                   | 1.10 | 2000 | 1.00 | 1 |
|                                    |                                       | (167) Hazel Tree                    | 0.80 | 1800 | 1.00 | 1 |
|                                    |                                       | (168) Olive                         | 0.70 | 1500 | 0.60 | 1 |
|                                    |                                       | (169) Other                         | 0.85 | 1500 | 0.80 | 1 |
|                                    | (170) Vineyard                        | (171) Wine                          | 0.85 | 1500 | 0.60 | 1 |
|                                    |                                       | (172) Pisco                         | 0.85 | 1500 | 0.60 | 1 |
|                                    | (180) Pasture and Fallow              |                                     | 0.85 | 800  | 0.50 | 0 |
| (200) Forest                       | (210) Native                          | (211) Mediterranean Evergreen       | 0.50 | 3000 | 1.50 | 0 |
|                                    |                                       | (212) Conifer                       | 0.65 | 2000 | 1.50 | 0 |
|                                    |                                       | (213) Temperate Broadleaf Deciduous | 0.65 | 2000 | 1.50 | 0 |
|                                    |                                       | (214) Temperate Broadleaf Evergreen | 0.70 | 2500 | 1.50 | 0 |
|                                    |                                       | (215) Chilean Wine Palm             | 0.65 | 1500 | 1.00 | 0 |
|                                    | (220) Tree Plantation                 | (221) Pine                          | 0.65 | 2500 | 2.00 | 0 |
|                                    |                                       | (222) Eucalyptus                    | 0.70 | 3000 | 1.50 | 0 |
|                                    |                                       | (223) Other                         | 0.65 | 2500 | 1.50 | 0 |
| (300) Shrubland                    | (310) Shrubland with Sparse Trees     |                                     | 0.50 | 1500 | 1.00 | 0 |
|                                    | (320) Shrubland with Succulent Plants |                                     | 0.60 | 800  | 0.50 | 0 |
|                                    | (330) Other                           |                                     | 0.50 | 1500 | 1.00 | 0 |
| (400) Natural Grassland and Tundra | (410) Steppe                          |                                     | 0.90 | 1000 | 0.50 | 0 |
|                                    | (420) Other Grassland                 |                                     | 0.90 | 800  | 0.50 | 0 |
|                                    | (430) Tundra                          |                                     | 0.90 | 500  | 0.30 | 0 |
| (500) Built-up land                |                                       |                                     | 1.00 | 50   | 1.00 | 0 |
| (600) Barren land                  |                                       |                                     | 1.00 | 200  | 0.00 | 0 |
| (700) Water Bodies and Salt Pans   | (710) Lakes                           |                                     | 1.20 | 0    | 0.00 | 1 |
|                                    | (720) Rivers                          |                                     | 1.20 | 0    | 0.00 | 1 |
|                                    | (730) Reservoirs                      |                                     | 1.20 | 0    | 0.00 | 1 |
|                                    | (740) Other Water Bodies              |                                     | 1.20 | 0    | 0.00 | 1 |
|                                    | (750) Wetland                         |                                     | 0.50 | 0    | 0.00 | 1 |
|                                    | (760) Salt Pans                       |                                     | 0.10 | 0    | 0.00 | 1 |
| (800) Glacier and Permanent Snow   |                                       |                                     | 0.20 | 0    | 0.00 | 1 |

**Table S3.** CR2WU classes, homogenized forcing data and water consumption rates for non-land cover sectors. All water consumption rates are expressed in liters per forcing unit per day.

| Level 1                          | Level 2           | Level 3                      | Forcing data at communal and yearly resolution<br>(the national total in 2020 is provided)                                                                                                     | Water consumption rate                                                     |
|----------------------------------|-------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| Drinking water<br>(100)          | Urban<br>(110)    | Domestic<br>(111)            | Population in urban areas, based on data from the National Institute of Statistics (INE, 1964; 1988; 1993; 2018a; 2018b; 2018c) and INE-CELADE (1972).<br>Urban population in 2020: 15,880,000 | 173 L/person/day, based on (SISS (2020a) and SISS (2020b)).                |
|                                  |                   | Commercial<br>(112)          | GDP in MUSD adjusted to 2020 USD value (millions), based on Banco Central (2020a, 2020b, 2020c, 2020d) and World Bank (2021).<br>Commercial GDP in 2020: 25,670 MUSD                           | 16,490 L/MUSD/day, based on SISS (2020a) and SISS (2020b).                 |
|                                  |                   | Industrial<br>(113)          | GDP in MUSD adjusted to 2020 USD value, based on Banco Central (2020a, 2020b, 2020c, 2020d) and World Bank (2021).<br>Industrial GDP in 2020: 27,360 MUSD                                      | 2,412 L/MUSD/day, based on SISS (2020a) and SISS (2020b).                  |
|                                  |                   | Green areas<br>(114)         | Population in urban areas, based on INE (1964, 1988, 1993, 2018a, 2018b, 2018c) and INE-CELADE (1972).<br>Urban population in 2020: 12,438,000 (*)                                             | 6 L/person/day, based on (SISS (2020a) and SISS (2020b)).                  |
|                                  | Rural<br>(120)    | Domestic<br>(121)            | Population in rural areas, based on INE (1964, 1988, 1993, 2018a, 2018b, 2018c) and INE-CELADE (1972).<br>Rural population in 2020: 2,174,462                                                  | 135 L/person/day based on DGA (2017).                                      |
| Unbilled drinking water<br>(200) | Urban<br>(210)    | Domestic<br>(211)            | Population in urban areas, based on data from the National Institute of Statistics (INE, 1964; 1988; 1993; 2018a; 2018b; 2018c) and INE-CELADE (1972).<br>Urban population in 2020: 15,880,000 | 60 L/person/day, based on SISS (2020a) and SISS (2020b) (**).              |
|                                  |                   | Commercial<br>(212)          | GDP in MUSD adjusted to 2020 USD value, based on Banco Central (2020a, 2020b, 2020c, 2020d) and World Bank (2021).<br>Commercial GDP in 2020: 25,670 MUSD                                      | 5,667 L/MUSD/day, based on SISS (2020a) and SISS (2020b) (**).             |
|                                  |                   | Industrial<br>(213)          | GDP in MUSD adjusted to 2020 USD value, based on Banco Central (2020a, 2020b, 2020c, 2020d) and World Bank (2021).<br>Industrial GDP in 2020: 27,360 MUSD                                      | 877 L/MUSD/day, based on SISS (2020a) and SISS (2020b) (**).               |
|                                  |                   | Green areas<br>(214)         | Population in urban areas, based on INE (1964, 1988, 1993, 2018a, 2018b, 2018c) and INE-CELADE (1972).<br>Urban population (applicable) in 2020: 12,438,000 (*)                                | 2 L/person/day, based on (SISS (2020a) and SISS (2020b) (**).              |
|                                  | Rural<br>(220)    | Domestic<br>(221)            | Population in rural areas, based on INE (1964, 1988, 1993, 2018a, 2018b, 2018c) and INE-CELADE (1972).<br>Rural population in 2020: 2,174,462                                                  | 27 L/person/day, based on DGA (2017) (**).                                 |
| Mining<br>(300)                  | Metallic<br>(310) | Copper concentrates<br>(311) | Fine copper production in tons, based on COCHILCO (2006, 2020a, 2021a, 2021b, 2021c).<br>Production in 2020: 4,170,000 t                                                                       | 234 L/Ton/day, based on COCHILCO (2020b, 2021d) and DGA (2017) (**).       |
|                                  |                   | Copper cathodes<br>(312)     | Fine copper production in tons, based on COCHILCO (2006, 2020a, 2021a, 2021b, 2021c).<br>Production in 2020: 1,560,000 t                                                                       | 128 L/Ton/day, based on COCHILCO (2020b, 2021d) and DGA (2017) (**).       |
|                                  |                   | Molybdenum<br>(313)          | Fine metal production in tons, based on COCHILCO (2006, 2020a, 2021a).<br>Production in 2020: 55,142 t                                                                                         | 2,045 L/Ton/day, based on COCHILCO (2020b, 2021d) and DGA (2017) (**).     |
|                                  |                   | Silver<br>(314)              | Fine metal production, based on COCHILCO (2006, 2020a, 2021a).<br>Production in 2020: 81 Ton (Valparaíso Region) (****)                                                                        | 558,000 L/Ton/day, based on COCHILCO (2020b, 2021d) and DGA (2017) (**).   |
|                                  |                   | Gold<br>(315)                | Fine metal production in tons, based on COCHILCO (2006, 2020a, 2021a).<br>Production in 2020: 34 t                                                                                             | 5,000,000 L/Ton/day, based on COCHILCO (2020b, 2021d) and DGA (2017) (**). |
|                                  |                   | Iron<br>(316)                | Fine metal production in tons, based on COCHILCO (2006, 2020a, 2021a).<br>Production in 2020: 9,891,000 Ton                                                                                    | 1.14 L/Ton/day, based on COCHILCO (2020b, 2021d) and DGA (2017) (**).      |

|                |                    |                         |                                                                                                                                               |                                                                                 |
|----------------|--------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
|                |                    | Zinc (317)              | Fine metal production in tons, based on COCHILCO (2006, 2020a, 2021a).<br>Production in 2020: 22,600 t (Aysén Region) (****)                  | 39 L/Ton/day, based on COCHILCO (2020b, 2021d) and DGA (2017) (***).            |
|                | Non Metallic (320) | Lithium Carbonate (321) | Ore production in tons, based on COCHILCO (2006, 2020a, 2021a).<br>Production in 2020: 114,260 t                                              | 55 L/Ton/day, based on MOP (2012) and DGA(2017).                                |
|                |                    | Nitrates (322)          | Ore production in tons, based on COCHILCO (2006, 2020a, 2021a).<br>Production in 2020: 996,515 t                                              | 27 L/Ton/day, based on MOP (2012) and DGA(2017).                                |
|                |                    | Iodine (323)            | Ore production in tons, based on COCHILCO (2006, 2020a, 2021a).<br>Production in 2020: 21,941 t                                               | 3,836 L/Ton/day, based on MOP (2012) and DGA(2017).                             |
|                |                    | Coal (324)              | Ore production in tons, based on COCHILCO (2006, 2020a, 2021a).<br>Production in 2020: 191,562 t                                              | 0.8 L/Ton/day, based on MOP (2012) and DGA(2017).                               |
|                |                    | Ulexite (325)           | Ore production in tons, based on COCHILCO (2006, 2020a, 2021a).<br>Production in 2020: 28,8103 t                                              | 7.7 L/Ton/day, based on MOP (2012) and DGA(2017).                               |
| Energy (400)   | Thermal (410)      | Gas (411)               | Gross energy produced in power plants, based on CNE (2019a, 2019b, 2019c, 2021a, 2021b, 2022).<br>Production in 2020: 13,705,802 MWh          | 37 L/MWh/day, based on DGA (2017) and Hardy & Garrido (2010).                   |
|                |                    | Oil (412)               | Gross energy produced in power plants, based on CNE (2019a, 2019b, 2019c, 2021a, 2021b, 2022).<br>Production in 2020: 851,902 MWh             | 67 L/MWh/day, based on DGA (2017) and based on Hardy & Garrido (2010).          |
|                |                    | Coal (413)              | Gross energy produced in power plants, based on CNE (2019a, 2019b, 2019c, 2021a, 2021b, 2022).<br>Production in 2020: 27,236,019 MWh          | 85 L/MWh/day, based on DGA (2017) and based on Hardy & Garrido (2010).          |
|                |                    | Biomass (414)           | Gross energy produced in power plants, based on CNE (2019a, 2019b, 2019c, 2021a, 2021b, 2022).<br>Production in 2020: 1,866,415 MWh           | 85 L/MWh/day, based on DGA (2017) and based on Hardy & Garrido (2010).          |
|                |                    | Geothermal (415)        | Gross energy produced in power plants, based on CNE (2019a, 2019b, 2019c, 2021a, 2021b, 2022).<br>Production in 2020: 246,876 MWh             | 20 L/MWh/day, based on DGA (2017) and based on Hardy & Garrido (2010).          |
|                | Hydraulic (420)    | Reservoir (421)         | Gross energy produced in power plants, based on CNE (2019a, 2019b, 2019c, 2021a, 2021b, 2022).<br>Production in 2020: 7,925,011 MWh           | 12,271 L/MWh/day, based on DGA (2017).                                          |
|                |                    | ROR (422)               | Gross energy produced in power plants, based on CNE (2019a, 2019b, 2019c, 2021a, 2021b, 2022).<br>Production in 2020: 12,293,579 MWh          | 11,338 L/MWh/day, based on DGA (2017).                                          |
|                | NCRE (430)         | Wind (431)              | Gross energy produced in power plants, based on CNE (2019a, 2019b, 2019c, 2021a, 2021b, 2022).<br>Production in 2020: 5,510,712 MWh           | -                                                                               |
|                |                    | Solar (432)             | Gross energy produced in power plants, based on CNE (2019a, 2019b, 2019c, 2021a, 2021b, 2022).<br>Production in 2020: 6,118,180 MWh           | -                                                                               |
| Industry (500) | Manufacture (510)  | Food (511)              | GDP in MUSD adjusted to 2020 USD value. Based on Banco Central (2020a, 2020b, 2020c, 2020d) and World Bank (2021).<br>GDP in 2020: 7,276 MUSD | 67,741 L/USD/day, based on DGA (2017), Statistics Canada (2011) and SMA (2021). |
|                |                    | Beverage (512)          | GDP in MUSD adjusted to 2020 USD value. Based on Banco Central (2020a, 2020b, 2020c, 2020d) and World Bank (2021).<br>GDP in 2020: 2,364 MUSD | 7,698 L/USD/day, based on DGA (2017), Statistics Canada (2011) and SMA (2021).  |

|                 |                |                                   |                                                                                                                                               |                                                                                  |
|-----------------|----------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
|                 |                | Cellulose (513)                   | GDP in MUSD adjusted to 2020 USD value. Based on Banco Central (2020a, 2020b, 2020c, 2020d) and World Bank (2021).<br>GDP in 2020: 1,891 MUSD | 258,601 L/USD/day, based on DGA (2017), Statistics Canada (2011) and SMA (2021). |
|                 |                | Wood (514)                        | GDP in MUSD adjusted to 2020 USD value. Based on Banco Central (2020a, 2020b, 2020c, 2020d) and World Bank (2021).<br>GDP in 2020: 946 MUSD   | 196,316 L/USD/day, based on DGA (2017), Statistics Canada (2011) and SMA (2021). |
|                 |                | Chemistry ((515)                  | GDP in MUSD adjusted to 2020 USD value. Based on Banco Central (2020a, 2020b, 2020c, 2020d) and World Bank (2021).<br>GDP in 2020: 2,407 MUSD | 100,951 L/USD/day, based on DGA (2017), Statistics Canada (2011) and SMA (2021). |
|                 |                | Minerals and Metal Products (516) | GDP in MUSD adjusted to 2020 USD value. Based on Banco Central (2020a, 2020b, 2020c, 2020d) and World Bank (2021).<br>GDP in 2020: 4,853 MUSD | 52177 L/USD/day, based on DGA (2017), Statistics Canada (2011) and SMA (2021).   |
|                 |                | Oil Refining (517)                | GDP in MUSD adjusted to 2020 USD value. Based on Banco Central (2020a, 2020b, 2020c, 2020d) and World Bank (2021).<br>GDP in 2020: 702 MUSD   | 287,882 L/USD/day, based on DGA (2017), Statistics Canada (2011) and SMA (2021). |
|                 |                | Textile (518)                     | GDP in MUSD adjusted to 2020 USD value. Based on Banco Central (2020a, 2020b, 2020c, 2020d) and World Bank (2021).<br>GDP in 2020: 26 MUSD    | 14,707 L/USD/day, based on DGA (2017), Statistics Canada (2011) and SMA (2021).  |
| Livestock (600) | Bovine (610)   | Cows (611)                        | Number of animals, based on INE (1959, 1969, 1983, 1998, 2008).<br>Heads in 2020: 1,681,333                                                   | 50 L/head/day, based on DGA (2017).                                              |
|                 |                | Heifers (612)                     | Number of animals, based on INE (1959, 1969, 1983, 1998, 2008).<br>Heads in 2020: 464,642                                                     | 27 L/head/day, based on DGA (2017).                                              |
|                 |                | Steers (613)                      | Number of animals, based on INE (1959, 1969, 1983, 1998, 2008).<br>Heads in 2020: 520,108                                                     | 35 L/head/day, based on DGA (2017).                                              |
|                 |                | Calves (614)                      | Number of animals, based on INE (1959, 1969, 1983, 1998, 2008).<br>Heads in 2020: 1,049,858                                                   | 23 L/head/day, based on DGA (2017).                                              |
|                 |                | Oxen (615)                        | Number of animals, based on INE (1959, 1969, 1983, 1998, 2008).<br>Heads in 2020: 46,425                                                      | 50 L/head/day, based on DGA (2017).                                              |
|                 |                | Bulls (616)                       | Number of animals, based on INE (1959, 1969, 1983, 1998, 2008).<br>Heads in 2020: 55,395                                                      | 50 L/head/day, based on DGA (2017).                                              |
|                 | Equines (620)  | Horses (621)                      | Number of animals, based on INE (1959, 1969, 1983, 1998, 2008).<br>Heads in 2020: 210,029                                                     | 45 L/head/day, based on DGA (2017).                                              |
|                 |                | Mules and Donkeys (622)           | Number of animals, based on INE (1959, 1969, 1983, 1998, 2008).<br>Heads in 2020: 15,752                                                      | 45 L/head/day, based on DGA (2017).                                              |
|                 | Camelids (630) | Llamas (631)                      | Number of animals, based on INE (1959, 1969, 1983, 1998, 2008).<br>Heads in 2020: 47,382                                                      | 3 L/head/day, based on DGA (2017).                                               |
|                 |                | Alpacas (632)                     | Number of animals, based on INE (1959, 1969, 1983, 1998, 2008).<br>Heads in 2020: 31,429                                                      | 3 L/head/day, based on DGA (2017).                                               |

|  |                |                      |                                                                                              |                                       |
|--|----------------|----------------------|----------------------------------------------------------------------------------------------|---------------------------------------|
|  | Birds<br>(640) | Chickens<br>(641)    | Number of animals, based on INE (1959, 1969, 1983, 1998, 2008).<br>Heads in 2020: 61,445,698 | 0.3 L/head/day, based on DGA (2017).  |
|  |                | Turkeys<br>(642)     | Number of animals, based on INE (1959, 1969, 1983, 1998, 2008).<br>Heads in 2020: 10,378,782 | 0.8 L/head/day, based on DGA (2017).  |
|  |                | Geese<br>(643)       | Number of animals, based on INE (1959, 1969, 1983, 1998, 2008).<br>Heads in 2020: 102,368    | 0.5 L/head/day, based on DGA (2017).  |
|  |                | Ducks<br>(644)       | Number of animals, based on INE (1959, 1969, 1983, 1998, 2008).<br>Heads in 2020: 196,976    | 0.5 L/head/day, based on DGA (2017).  |
|  |                | Other Birds<br>(645) | Number of animals, based on INE (1959, 1969, 1983, 1998, 2008).<br>Heads in 2020: 180,610    | 0.31 L/head/day, based on DGA (2017). |
|  | Other<br>(650) | Pigs<br>(651)        | Number of animals, based on INE (1959, 1969, 1983, 1998, 2008).<br>Heads in 2020: 5,536,314  | 30 L/head/day, based on DGA (2017).   |
|  |                | Sheeps<br>(652)      | Number of animals, based on INE (1959, 1969, 1983, 1998, 2008).<br>Heads in 2020: 4,296,651  | 3.25 L/head/day, based on DGA (2017). |
|  |                | Goats<br>(653)       | Number of animals, based on INE (1959, 1969, 1983, 1998, 2008).<br>Heads in 2020: 337,810    | 2.5 L/head/day, based on DGA (2017).  |
|  |                | Rabbits<br>(654)     | Number of animals, based on INE (1959, 1969, 1983, 1998, 2008).<br>Heads in 2020: 49,929     | 0.35 L/head/day, based on DGA (2017). |

(\*) For classes associated with green areas (114 and 214), the total population counted only considered communes where data on water use for green area irrigation was available in SISS (2020a).

(\*\*) For these classes, an auxiliary factor is applied that characterizes the percentage of water loss that is not billed. At the national level, the representative factor is 35% for urban uses, and 20% for rural uses. These variables are available in the associated Zenodo repository with different values for each commune.

(\*\*\*) In the classes associated with silver and zinc production (314 and 317) there were limitations in finding the location of the respective mines. In the case of silver, the national production is actually 1,580 Ton and for zinc it is 28,660 Ton. In the case of silver, the identification of the specific use is still pending, which is regularly associated with copper extraction, so the use of water is mixed.

(\*\*\*\*) These rates are expressed per unit of fine metal. The utilization rates found for metal production are originally expressed per unit of ore processed, which is why it is necessary to have an auxiliary variable called ore grade. These variables are also available in <https://doi.org/10.5281/zenodo.13324235> (Boisier et al., 2024b), with spatial and temporal variability for the core classes (311 and 312) and spatial variability for the other metals.

## References in Supplement

Banco Central: Producto interno bruto por clase de actividad económica (base 1977), available at: [https://si3.bcentral.cl/Siete/ES/Siete/Cuadro/CAP\\_CCNN/MN\\_CCNN76/CCNN1977\\_P1/CCNN1977\\_P1](https://si3.bcentral.cl/Siete/ES/Siete/Cuadro/CAP_CCNN/MN_CCNN76/CCNN1977_P1/CCNN1977_P1), 2022a.

Banco Central: Producto interno bruto por clase de actividad económica (base 1986), available at: [https://si3.bcentral.cl/Siete/ES/Siete/Cuadro/CAP\\_CCNN/MN\\_CCNN76/CCNN1986\\_P1\\_A/CCNN1986\\_P1\\_A](https://si3.bcentral.cl/Siete/ES/Siete/Cuadro/CAP_CCNN/MN_CCNN76/CCNN1986_P1_A/CCNN1986_P1_A), 2022b.

Banco Central: Producto interno bruto por clase de actividad económica (base 1996), available at: [https://si3.bcentral.cl/Siete/ES/Siete/Cuadro/CAP\\_CCNN/MN\\_CCNN76/CCNN1996\\_P1/CCNN1996\\_P1](https://si3.bcentral.cl/Siete/ES/Siete/Cuadro/CAP_CCNN/MN_CCNN76/CCNN1996_P1/CCNN1996_P1), 2022c.

Banco Central: Producto interno bruto por clase de actividad económica (referencia 2013), available at: [https://si3.bcentral.cl/Siete/ES/Siete/Cuadro/CAP\\_CCNN/MN\\_CCNN76/CCNN2013\\_P1/CCNN2013\\_P1](https://si3.bcentral.cl/Siete/ES/Siete/Cuadro/CAP_CCNN/MN_CCNN76/CCNN2013_P1/CCNN2013_P1), 2022d.

Bi, D., Dix, M., Marsland, S., O'Farrell, S., Sullivan, A., Bodman, R., et al.: Configuration and spin-up of ACCESS-CM2, the new generation Australian Community Climate and Earth System Simulator Coupled Model, *J. South. Hemisph. Earth Syst. Sci.*, 70, 225–251, <https://doi.org/10.1071/ES19040>, 2020.

Boucher, O., Servonnat, J., Albright, A. L., Aumont, O., Balkanski, Y., Bastrikov, V., et al.: Presentation and evaluation of the IPSL-CM6A-LR climate model, *J. Adv. Model. Earth Syst.*, 12, e2019MS002010, <https://doi.org/10.1029/2019MS002010>, 2020.

British Petroleum: Statistical Review of World Energy, available at: <https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html>, 2021.

Cherchi, A., Anav, A., Zanchettin, D., and Gualdi, S.: The CMCC Earth System Model (CMCC-ESM2), *Geosci. Model Dev.*, 12, 2983–2996, <https://doi.org/10.5194/gmd-12-2983-2019>, 2019.

CNE: Generación Bruta Sistemas Medianos de Aysén, Comisión Nacional de Energía, available at: [https://www.cne.cl/wp-content/uploads/2019/06/generacion\\_bruta\\_Aysxn.xlsx](https://www.cne.cl/wp-content/uploads/2019/06/generacion_bruta_Aysxn.xlsx), 2019a.

CNE: Generación Bruta Sistemas Medianos de Los Lagos, Comisión Nacional de Energía, available at: [https://www.cne.cl/wp-content/uploads/2019/06/generacion\\_bruta\\_Cch-Hor.xlsx](https://www.cne.cl/wp-content/uploads/2019/06/generacion_bruta_Cch-Hor.xlsx), 2019b.

CNE: Generación Bruta Sistemas Medianos de Magallanes, Comisión Nacional de Energía, available at: [https://www.cne.cl/wp-content/uploads/2019/06/generacion\\_bruta\\_Magallanes.xlsx](https://www.cne.cl/wp-content/uploads/2019/06/generacion_bruta_Magallanes.xlsx), 2019c.

CNE: Anuario Estadístico de Energía 2020, Comisión Nacional de Energía, available at: <https://www.cne.cl/nuestros-servicios/reportes/informacion-y-estadisticas/>, 2021a.

CNE: Electricidad: Producción y consumo, Comisión Nacional de Energía, available at: <https://www.cne.cl/normativas/electrica/consulta-publica/electricidad/>, 2021b.

CNE: Generación Bruta SEN, Comisión Nacional de Energía, available at: [https://www.cne.cl/wp-content/uploads/2022/06/Generacion\\_Bruta.xlsx](https://www.cne.cl/wp-content/uploads/2022/06/Generacion_Bruta.xlsx), 2022.

COCHILCO: Anuario Estadísticas del cobre y Otros Minerales 1985-2004, Comisión Chilena del Cobre, available at: <https://www.cochilco.cl/Lists/Anuario/Attachments/11/Anuario2004.pdf>, 2006.

COCHILCO: Anuario de estadísticas del cobre y otros minerales 2000-2019, Comisión Chilena del Cobre, available at: <https://www.cochilco.cl/Lists/Anuario/Attachments/23/AE2019WEB.pdf>, 2020a.

COCHILCO: Consumo de agua en la minería del cobre al 2015, Comisión Chilena del Cobre, available at: <https://www.cochilco.cl/Listado> Tentico/Consumo de agua en la minería del cobre al 2015.pdf, 2020b.

COCHILCO: Anuario Estadísticas del cobre y Otros Minerales 2005-2021, Comisión Chilena del Cobre, available at: <https://www.cochilco.cl/Lists/Anuario/Attachments/24/Ae2021b.pdf>, 2021a.

COCHILCO: Producción chilena de cobre por producto, available at: [https://www.cochilco.cl/layouts/download.aspx?SourceUrl=/Produccion%20Minera/6.1\\_produccion\\_cobre\\_por\\_producto\\_anual-1960.xls](https://www.cochilco.cl/layouts/download.aspx?SourceUrl=/Produccion%20Minera/6.1_produccion_cobre_por_producto_anual-1960.xls), 2021b.

COCHILCO: Producción cobre de mina por empresa, available at: [https://www.cochilco.cl/layouts/download.aspx?SourceUrl=/Produccion%20Minera/1.1\\_Produccion\\_cobre\\_por\\_empresas\\_mensual-2000.xlsx](https://www.cochilco.cl/layouts/download.aspx?SourceUrl=/Produccion%20Minera/1.1_Produccion_cobre_por_empresas_mensual-2000.xlsx), 2021c.

COCHILCO: Recursos hídricos en la minería del cobre. Actualización 2020, Comisión Chilena del Cobre, available at:

<https://www.cochilco.cl/Listado%20Temtico/Informe%20recursos%20hidricos%20en%20la%20mineria%20del%20cobre%202020.pdf>, 2021d.

DGA – Dirección General de Aguas: Estimación de la demanda actual, proyecciones futuras y caracterización de la calidad de los recursos hídricos en Chile, SIT N° 419, Ministerio de Obras Públicas, Dirección General de Aguas, realizado por Unión Temporal de Proveedores: Hídrica Consultores SpA y Aquaterra Ingenieros Ltda., Santiago, Chile, 2017.

Döscher, R., Acosta, M., Alessandri, A., Anthoni, P., Arsouze, T., Bergman, T., et al.: The EC-Earth3 Earth system model for the Coupled Model Intercomparison Project 6, *Geosci. Model Dev.*, 15, 2973–3020, <https://doi.org/10.5194/gmd-15-2973-2022>, 2022.

Dunne, J. P., Horowitz, L. W., Adcroft, A. J., Ginoux, P., Held, I. M., John, J. G., et al.: The GFDL Earth System Model Version 4.1 (GFDL-ESM 4.1): Overall coupled model description and simulation characteristics, *J. Adv. Model. Earth Syst.*, 12, e2019MS002015, <https://doi.org/10.1029/2019MS002015>, 2020.

Hardy, L. and Garrido, A.: Análisis y evaluación de las relaciones entre el agua y la energía en España, Fundación Botín, <https://crcc.es/wp-content/uploads/2012/02/Hardy-y-Garrido.-2010Análisis-de-lar-relación-aguaenergía.pdf> (last access: 01 October 2023), 2010.

INE: III Censo Nacional Agrícola Ganadero (1955)—Resumen General del País, Instituto Nacional de Estadísticas, 1959.

INE: Características básicas de la población (Censo 1960), Instituto Nacional de Estadísticas, available at: <https://www.memoriachilena.gob.cl/602/w3-article-86206.html>, 1964.

INE: IV Censo Nacional Agropecuario (1975–1976)—Resumen General del País, Instituto Nacional de Estadísticas, 1969.

INE: V Censo Nacional Agropecuario (1975–1976)—Total País, Instituto Nacional de Estadísticas, 1983.

INE: XV Censo Nacional de Población y IV de Vivienda (1982), Instituto Nacional de Estadísticas, available at: <https://www.memoriachilena.gob.cl/602/w3-article-86208.html>, 1988.

INE: Censos de 1970–1982: Cifras comparativas, Instituto Nacional de Estadísticas, available at: <https://www.memoriachilena.gob.cl/602/w3-article-86207.html>, 1993.

INE: VI Censo Nacional Agropecuario (1997), Instituto Nacional de Estadísticas, 1998.

INE: VII Censo Nacional Agropecuario y Forestal (2007)—Informe Metodológico, Instituto Nacional de Estadísticas, 2008.

INE: Resultados Censo de Población y Vivienda 1992, available at: [https://redatam-ine.ine.cl/redbin/RpWebEngine.exe/Portal?BASE=CENSO\\_1992&lang=esp](https://redatam-ine.ine.cl/redbin/RpWebEngine.exe/Portal?BASE=CENSO_1992&lang=esp), 2018a.

INE: Resultados Censo de Población y Vivienda 2002, available at: [https://redatam-ine.ine.cl/redbin/RpWebEngine.exe/Portal?BASE=CENSO\\_2002&lang=esp](https://redatam-ine.ine.cl/redbin/RpWebEngine.exe/Portal?BASE=CENSO_2002&lang=esp), 2018b.

INE: Resultados Censo de Población y Vivienda 2017, available at: [https://redatam-ine.ine.cl/redbin/RpWebEngine.exe/Portal?BASE=CENSO\\_2017&lang=esp](https://redatam-ine.ine.cl/redbin/RpWebEngine.exe/Portal?BASE=CENSO_2017&lang=esp), 2018c.

INE-CELADE: Chile. XI Censo de población (1940). Recopilación de cifras publicadas por la Dirección de Estadísticas y Censos, Instituto Nacional de Estadísticas, available at: <https://repositorio.cepal.org/handle/11362/8021>, 1972.

Lee, W.-L., Wang, Y.-C., Shiu, C.-J., Tsai, I., Tu, C.-Y., Lan, Y.-Y., et al.: Taiwan Earth System Model Version 1: description and evaluation of mean state, *Geosci. Model Dev.*, 13, 3887–3904, <https://doi.org/10.5194/gmd-13-3887-2020>, 2020.

Li, L., Dong, L., Xie, J., Tang, Y., Xie, F., Guo, Z., et al.: The GAMIL3: Model Description and Evaluation, *J. Geophys. Res. Atmos.*, 125, e2020JD032574, <https://doi.org/10.1029/2020JD032574>, 2020.

Mauritsen, T., Bader, J., Becker, T., Behrens, J., Bittner, M., Brokopf, R., et al.: Developments in the MPI-M Earth System Model version 1.2 (MPI-ESM1.2) and its response to increasing CO<sub>2</sub>, *J. Adv. Model. Earth Syst.*, 11, 998–1038, <https://doi.org/10.1029/2018MS001400>, 2019.

MOP – Ministerio de Obras Públicas: Decreto 743: Fija tabla de equivalencias entre caudales de agua y usos, que refleja las prácticas habituales en el país en materia de aprovechamiento de aguas, available at: <https://bcn.cl/3jz1u>, (last access: 01 October 2023), 2012.

Seland, Ø., Bentsen, M., Olivié, D., Toniazzi, T., Gjermundsen, A., Graff, L. S., et al.: Overview of the Norwegian Earth System Model (NorESM2) and key climate response of CMIP6 DECK, historical, and scenario simulations, *Geosci. Model Dev.*, 13, 6165–6200, <https://doi.org/10.5194/gmd-13-6165-2020>, 2020.

Sellar, A. A., Jones, C. G., Mulcahy, J. P., Tang, Y., Yool, A., Wiltshire, A., et al.: UKESM1: Description and evaluation of the U.K. Earth System Model, *J. Adv. Model. Earth Syst.*, 11, 4513–4558, <https://doi.org/10.1029/2019MS001739>, 2019.

Séférian, R., Nabat, P., Michou, M., Saint-Martin, D., Voldoire, A., Colin, J., et al.: Evaluation of CNRM Earth-System model, CNRM-ESM2-1: role of Earth system processes in present-day and future climate, *J. Adv. Model. Earth Syst.*, 11, 4182–4227, <https://doi.org/10.1029/2019MS001791>, 2019.

SISS: SIFAC II: Consumos y Clientes Mensuales 2012–2019 (non-public data requested by Law 20.285 of the Republic of Chile), Superintendencia de Servicios Sanitarios, available at: <https://www.siss.gob.cl/586/w3-article-7247.html>, 2020a.

SISS: SIFAC II: Niveles y Producción de Agua (non-public data requested by Law 20.285 of the Republic of Chile), Superintendencia de Servicios Sanitarios, available at: <https://www.siss.gob.cl/586/w3-article-7247.html>, 2020b.

SMA: Datos abiertos: Descargas de RILES (D.S. 90/2000 y D.S. 46/2002) (Sistema Nacional de Fiscalización Ambiental), Superintendencia del Medio Ambiente, available at: <https://snifa.sma.gob.cl/DatosAbiertos>, 2021.

Statistics Canada: Industrial Water Use, Minister of Industry (Canada), available at: <https://www150.statcan.gc.ca/n1/pub/16-401-x/16-401-x2014001-eng.pdf>, 2011.

Swart, N. C., Cole, J. N. S., Kharin, V. V., Lazare, M., Scinocca, J. F., Gillett, N. P., et al.: The Canadian Earth System Model version 5 (CanESM5.0.3), *Geosci. Model Dev.*, 12, 4823–4873, <https://doi.org/10.5194/gmd-12-4823-2019>, 2019.

Tatebe, H., Ogura, T., Nitta, T., Komuro, Y., Ogochi, K., Takemura, T., et al.: Description and basic evaluation of simulated mean state, internal variability, and climate sensitivity in MIROC6, *Geosci. Model Dev.*, 12, 2727–2765, <https://doi.org/10.5194/gmd-12-2727-2019>, 2019.

Voldoire, A., Saint-Martin, D., Sénési, S., Decharme, B., Alias, A., Chevallier, M., Séférian, R., y col.: Evaluation of CMIP6 DECK experiments with CNRM-CM6-1, *J. Adv. Model. Earth Syst.*, 11, 2177–2213, <https://doi.org/10.1029/2019MS001683>, 2019.

World Bank: GDP (current US\$)—Chile, available at: <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=CL>, 2021.

Wu, T., Lu, Y., Fang, Y., Xin, X., Li, L., Li, W., et al.: The Beijing Climate Center Climate System Model (BCC-CSM): the main progress from CMIP5 to CMIP6, *Geosci. Model Dev.*, 12, 1573–1600, <https://doi.org/10.5194/gmd-12-1573-2019>, 2019.

Yukimoto, S., Kawai, H., Koshiro, T., Oshima, N., Yoshida, K., Urakawa, S., et al.: The Meteorological Research Institute Earth System Model Version 2.0, MRI-ESM2.0: Description and Basic Evaluation of the Physical Component, *J. Meteorol. Soc. Jpn. Ser. II*, 97, 931–965, <https://doi.org/10.2151/jmsj.2019-051>, 2019.

Ziehn, T., Chamberlain, M. A., Law, R. M., Lenton, A., Bodman, R. W., Dix, M., et al.: The Australian Earth System Model: ACCESS-ESM1.5, *J. South. Hemisph. Earth Syst. Sci.*, 70, 193–214, 2020.