Cidades-Unesp

Panosso AR

2024-01-22

### Carregando bibliotecas

library(tidyverse)

## ── Attaching core tidyverse packages ──────────────────────── tidyverse 2.0.0 ──  
## ✔ dplyr 1.1.4 ✔ readr 2.1.4  
## ✔ forcats 1.0.0 ✔ stringr 1.5.1  
## ✔ ggplot2 3.4.4 ✔ tibble 3.2.1  
## ✔ lubridate 1.9.3 ✔ tidyr 1.3.0  
## ✔ purrr 1.0.2   
## ── Conflicts ────────────────────────────────────────── tidyverse\_conflicts() ──  
## ✖ dplyr::filter() masks stats::filter()  
## ✖ dplyr::lag() masks stats::lag()  
## ℹ Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors

library(geobr)

## Loading required namespace: sf

source("R/gafico.R")

### Carregando as bases de dados

emissions\_sources <- read\_rds("data/emissions\_sources.rds") %>%   
 mutate(source\_name\_1 = str\_to\_title(source\_name))  
states <- read\_rds("data/states.rds") %>%   
 mutate(name\_region = ifelse(name\_region == "Centro Oeste","Centro-Oeste",name\_region))  
  
brazil\_ids <- read\_rds("data/df\_nome.rds")  
glimpse(emissions\_sources)

## Rows: 2,853,440  
## Columns: 30  
## $ source\_id <int> 10805081, 10722332, 10722332, 10722332, 1072…  
## $ iso3\_country <chr> "BRA", "BRA", "BRA", "BRA", "BRA", "BRA", "B…  
## $ original\_inventory\_sector <chr> "cropland-fires", "cropland-fires", "croplan…  
## $ start\_time <date> 2022-01-01, 2022-01-01, 2022-01-01, 2022-01…  
## $ end\_time <date> 2022-12-31, 2022-12-31, 2022-12-31, 2022-12…  
## $ temporal\_granularity <chr> "annual", "annual", "annual", "annual", "ann…  
## $ gas <chr> "co2", "co2", "ch4", "n2o", "co2e\_100yr", "c…  
## $ emissions\_quantity <dbl> 11058.3448, 7718135.9166, 13755.0934, 356.61…  
## $ created\_date <date> 2023-11-03, 2023-11-03, 2023-11-03, 2023-11…  
## $ modified\_date <date> 2023-11-03, 2023-11-03, 2023-11-03, 2023-11…  
## $ source\_name <chr> "Coqueiro Seco", "Pernambuco", "Pernambuco",…  
## $ source\_type <chr> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, …  
## $ lat <dbl> -9.642262, -8.325216, -8.325216, -8.325216, …  
## $ lon <dbl> -35.80874, -37.99768, -37.99768, -37.99768, …  
## $ geometry\_ref <chr> "gadm\_BRA.2.23\_2", "gadm\_BRA.17\_1", "gadm\_BR…  
## $ directory <chr> "data-raw/BRA/agriculture/cropland-fires\_emi…  
## $ emissions\_factor <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, …  
## $ emissions\_factor\_units <chr> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, …  
## $ capacity <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, …  
## $ capacity\_units <chr> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, …  
## $ capacity\_factor <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, …  
## $ activity <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, …  
## $ activity\_units <chr> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, …  
## $ year <dbl> 2022, 2022, 2022, 2022, 2022, 2022, 2017, 20…  
## $ sector\_name <chr> "agriculture", "agriculture", "agriculture",…  
## $ sub\_sector <chr> "cropland-fires", "cropland-fires", "croplan…  
## $ sigla\_uf <chr> "AL", "PE", "PE", "PE", "PE", "PE", "PE", "P…  
## $ nome\_regiao <chr> "Nordeste", "Nordeste", "Nordeste", "Nordest…  
## $ city\_ref <chr> "Coqueiro Seco", "Betânia", "Betânia", "Betâ…  
## $ source\_name\_1 <chr> "Coqueiro Seco", "Pernambuco", "Pernambuco",…

nomes\_uf <- c(brazil\_ids$nome\_uf %>% unique(),"Brazil")  
abbrev\_states <- brazil\_ids$sigla\_uf %>% unique()  
region\_names <- brazil\_ids$nome\_regiao %>% unique()

### tabela resumo

emissions\_sources %>%   
 filter(  
 year == 2022,  
 gas == "co2e\_100yr",  
 !source\_name %in% nomes\_uf,  
 !sub\_sector %in% c("forest-land-clearing",  
 "forest-land-degradation",  
 "shrubgrass-fires",  
 "forest-land-fires",  
 "wetland-fires",  
 "removals")  
 ) %>%   
 group\_by(source\_name) %>%   
 summarise(  
 emission = mean(emissions\_quantity, na.rm=TRUE)  
 ) %>%   
 arrange(emission %>% desc()) %>%   
 mutate(  
 acumulada = cumsum(emission)  
 )

## # A tibble: 9,842 × 3  
## source\_name emission acumulada  
## <chr> <dbl> <dbl>  
## 1 Tupi 36338342. 36338342.  
## 2 São Paulo Urban Area in São Paulo Municipality 9272765. 45611107.  
## 3 Buzios 7412823. 53023929.  
## 4 Porto do Pecém power station 5956000 58979929.  
## 5 Marlim 5402369. 64382298.  
## 6 Petrobras REPLAN Paulinia Refinery 4991726. 69374025.  
## 7 Jorge Lacerda power station 4704000 74078025.  
## 8 Rio de Janeiro Urban Area in Rio de Janeiro Municipality 4665274. 78743299.  
## 9 Tres Lagoas Pulp Mill 3987092 82730391.  
## 10 Sapinhoa 3609112. 86339503.  
## # ℹ 9,832 more rows

emissions\_sources %>%   
 filter(str\_detect(city\_ref,"Botucatu"),  
 # city\_ref == "Santos",  
 sigla\_uf == "SP",  
 year == 2022,  
 gas == "co2e\_100yr",  
 !source\_name %in% nomes\_uf,  
 !sub\_sector %in% c("forest-land-clearing",  
 "forest-land-degradation",  
 "shrubgrass-fires",  
 "forest-land-fires",  
 "wetland-fires",  
 "removals")  
 ) %>%   
 group\_by(sector\_name,source\_name,sub\_sector) %>%   
 summarise(  
 emission = mean(emissions\_quantity, na.rm=TRUE)  
 ) %>%   
 arrange(emission ) %>%   
 ungroup() %>%   
 mutate(Cumsum = cumsum(emission))

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

## # A tibble: 10 × 5  
## sector\_name source\_name sub\_sector emission Cumsum  
## <chr> <chr> <chr> <dbl> <dbl>  
## 1 forestry Botucatu net-fores… -1.04e6 -1.04e6  
## 2 forestry Botucatu net-shrub… -8.06e4 -1.12e6  
## 3 forestry Botucatu net-wetla… -2.47e3 -1.13e6  
## 4 waste ETE RUBIAO JUNIOR PARTE 1 wastewate… 1.07e3 -1.13e6  
## 5 waste ETE SEDE LAGEADO wastewate… 7.51e3 -1.12e6  
## 6 agriculture Botucatu synthetic… 1.39e4 -1.10e6  
## 7 agriculture Botucatu manure-le… 2.23e4 -1.08e6  
## 8 agriculture Botucatu enteric-f… 7.76e4 -1.00e6  
## 9 transportation Botucatu Urban Area in Botucatu M… road-tran… 1.58e5 -8.46e5  
## 10 agriculture Botucatu cropland-… 1.89e5 -6.57e5

# nomenclatura no site  
# net-forest-land => Forest land  
# net-wetland => Wetland  
# net-shrubgrass => Net shrubgrass  
# cropland-fires => Crop fire  
# synthetic-fertilizer-application => Crop field  
# enteric-fermentation-cattle-pasture => Cattle pasture  
# manure-left-on-pasture-cattle => Pasture cattle

# unidades unesp  
cidades\_unesp <- read.table("data-raw/unidades-unesp.txt", h=TRUE) %>%   
 pull(V1)  
  
for(i in seq\_along(cidades\_unesp)){  
 resumo\_unesp<-emissions\_sources %>%   
 filter(str\_detect(city\_ref,cidades\_unesp[i]),  
 sigla\_uf == "SP",  
 year == 2022,  
 gas == "co2e\_100yr",  
 !source\_name %in% nomes\_uf,  
 !sub\_sector %in% c("forest-land-clearing",  
 "forest-land-degradation",  
 "shrubgrass-fires",  
 "forest-land-fires",  
 "wetland-fires",  
 "removals")  
 ) %>%   
 group\_by(sector\_name,source\_name,sub\_sector) %>%   
 summarise(  
 emission = mean(emissions\_quantity, na.rm=TRUE)  
 ) %>%   
 arrange(emission ) %>%   
 ungroup() %>%   
 mutate(Cumsum = cumsum(emission))  
 print(resumo\_unesp)  
 }

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

## # A tibble: 13 × 5  
## sector\_name source\_name sub\_sector emission Cumsum  
## <chr> <chr> <chr> <dbl> <dbl>  
## 1 forestry Araçatuba net-shrub… -90628. -90628.  
## 2 forestry Araçatuba net-wetla… -2928. -93556.  
## 3 forestry Araçatuba net-fores… -2365. -95922.  
## 4 transportation Araçatuba Airport domestic-… 3561. -92361.  
## 5 waste ETE MARIA ISABEL wastewate… 3919. -88443.  
## 6 waste ETE BAGUACU wastewate… 8817. -79626.  
## 7 agriculture Araçatuba synthetic… 15945. -63680.  
## 8 agriculture Araçatuba manure-le… 29656. -34024.  
## 9 agriculture Araçatuba enteric-f… 103034. 69009.  
## 10 waste OpenStreetMap Landfill solid-was… 256866. 325875.  
## 11 transportation Araçatuba Urban Area in Araçatuba… road-tran… 288889. 614765.  
## 12 agriculture Araçatuba cropland-… 329288. 944052.  
## 13 transportation Araçatuba Airport internati… NaN NaN

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

## # A tibble: 12 × 5  
## sector\_name source\_name sub\_sector emission Cumsum  
## <chr> <chr> <chr> <dbl> <dbl>  
## 1 forestry Araraquara net-fores… -56567. -56567.  
## 2 forestry Araraquara net-shrub… -15590. -72156.  
## 3 forestry Araraquara net-wetla… 32.1 -72124.  
## 4 agriculture Araraquara manure-le… 3350. -68774.  
## 5 agriculture Araraquara synthetic… 4615. -64159.  
## 6 agriculture Araraquara enteric-f… 11639. -52519.  
## 7 waste ETE ARARAQUARA wastewate… 14210. -38309.  
## 8 waste OpenStreetMap Landfill solid-was… 195898. 157588.  
## 9 transportation Araraquara Urban Area in Araraqu… road-tran… 320813. 478402.  
## 10 agriculture Araraquara cropland-… 983038. 1461440.  
## 11 transportation Araraquara Airport domestic-… NaN NaN   
## 12 transportation Araraquara Airport internati… NaN NaN

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

## # A tibble: 11 × 5  
## sector\_name source\_name sub\_sector emission Cumsum  
## <chr> <chr> <chr> <dbl> <dbl>  
## 1 forestry Assis net-fores… -16373. -16373.  
## 2 forestry Assis net-shrub… -5045. -21417.  
## 3 forestry Assis net-wetla… 126. -21291.  
## 4 waste ETE ASSIS JACU wastewate… 2059. -19233.  
## 5 agriculture Assis synthetic… 4606. -14627.  
## 6 waste ETE ASSIS FORTUNINHA wastewate… 4610. -10016.  
## 7 agriculture Assis manure-le… 7269. -2748.  
## 8 agriculture Assis enteric-f… 25253. 22505.  
## 9 transportation Assis Urban Area in Assis Municip… road-tran… 129527. 152032.  
## 10 agriculture Assis cropland-… 192982. 345014.  
## 11 waste OpenStreetMap Landfill solid-was… 208758. 553772.

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

## # A tibble: 9 × 5  
## sector\_name source\_name sub\_sector emission Cumsum  
## <chr> <chr> <chr> <dbl> <dbl>  
## 1 forestry Bauru net-shrub… -1.45e5 -1.45e5  
## 2 forestry Bauru net-wetla… 5.34e1 -1.45e5  
## 3 waste ETE CANDEIA wastewate… 2.52e3 -1.42e5  
## 4 forestry Bauru net-fores… 1.01e4 -1.32e5  
## 5 agriculture Bauru synthetic… 1.37e4 -1.18e5  
## 6 agriculture Bauru manure-le… 1.56e4 -1.03e5  
## 7 agriculture Bauru cropland-… 4.00e4 -6.28e4  
## 8 agriculture Bauru enteric-f… 5.43e4 -8.57e3  
## 9 transportation Bauru Urban Area in Bauru Municipa… road-tran… 4.81e5 4.73e5

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

## # A tibble: 10 × 5  
## sector\_name source\_name sub\_sector emission Cumsum  
## <chr> <chr> <chr> <dbl> <dbl>  
## 1 forestry Botucatu net-fores… -1.04e6 -1.04e6  
## 2 forestry Botucatu net-shrub… -8.06e4 -1.12e6  
## 3 forestry Botucatu net-wetla… -2.47e3 -1.13e6  
## 4 waste ETE RUBIAO JUNIOR PARTE 1 wastewate… 1.07e3 -1.13e6  
## 5 waste ETE SEDE LAGEADO wastewate… 7.51e3 -1.12e6  
## 6 agriculture Botucatu synthetic… 1.39e4 -1.10e6  
## 7 agriculture Botucatu manure-le… 2.23e4 -1.08e6  
## 8 agriculture Botucatu enteric-f… 7.76e4 -1.00e6  
## 9 transportation Botucatu Urban Area in Botucatu M… road-tran… 1.58e5 -8.46e5  
## 10 agriculture Botucatu cropland-… 1.89e5 -6.57e5

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

## # A tibble: 9 × 5  
## sector\_name source\_name sub\_sector emission Cumsum  
## <chr> <chr> <chr> <dbl> <dbl>  
## 1 forestry Dracena net-shrubgrass -72258. -72258.  
## 2 forestry Dracena net-forest-land -12618. -84876.  
## 3 forestry Dracena net-wetland -536. -85412.  
## 4 waste ETE MIRASSOL DRACENA wastewater-treatment-and-… 951. -84461.  
## 5 waste ETE BAIRRO DAS ANTAS wastewater-treatment-and-… 1905. -82555.  
## 6 agriculture Dracena synthetic-fertilizer-appl… 7820. -74735.  
## 7 agriculture Dracena manure-left-on-pasture-ca… 15389. -59347.  
## 8 agriculture Dracena enteric-fermentation-catt… 53464. -5882.  
## 9 agriculture Dracena cropland-fires 55567. 49684.

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

## # A tibble: 15 × 5  
## sector\_name source\_name sub\_sector emission Cumsum  
## <chr> <chr> <chr> <dbl> <dbl>  
## 1 forestry Franca net-shrub… -6164. -6164.  
## 2 forestry Franca net-wetla… -80.8 -6245.  
## 3 waste ETE CITY PETRoPOLIS wastewate… 56.4 -6188.  
## 4 waste ETE PAULISTANO II wastewate… 294. -5894.  
## 5 waste ETE PAULISTANO I wastewate… 406. -5488.  
## 6 waste ETE JARDIM LUIZA wastewate… 1221. -4267.  
## 7 agriculture Franca synthetic… 2704. -1564.  
## 8 agriculture Franca manure-le… 11480. 9916.  
## 9 waste ETE FRANCA wastewate… 20451. 30367.  
## 10 forestry Franca net-fores… 23038. 53405.  
## 11 agriculture Franca cropland-… 26759. 80164.  
## 12 agriculture Franca enteric-f… 39884. 120048.  
## 13 transportation Franca Urban Area in Franca Munic… road-tran… 509384. 629432.  
## 14 transportation Tenente Lund Pressoto Airport domestic-… NaN NaN   
## 15 transportation Tenente Lund Pressoto Airport internati… NaN NaN

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

## # A tibble: 11 × 5  
## sector\_name source\_name sub\_sector emission Cumsum  
## <chr> <chr> <chr> <dbl> <dbl>  
## 1 forestry Guaratinguetá net-fores… -3.23e5 -3.23e5  
## 2 forestry Guaratinguetá net-shrub… -6.50e4 -3.88e5  
## 3 forestry Guaratinguetá net-wetla… -1.76e2 -3.89e5  
## 4 waste ETE PEDRINHAS GUARATINGUETA wastewate… 1.00e1 -3.89e5  
## 5 waste ETE VILA BELA wastewate… 6.13e2 -3.88e5  
## 6 waste ETE CAMPO DO GALVAO wastewate… 7.53e2 -3.87e5  
## 7 agriculture Guaratinguetá cropland-… 4.07e3 -3.83e5  
## 8 agriculture Guaratinguetá synthetic… 7.68e3 -3.76e5  
## 9 agriculture Guaratinguetá manure-le… 1.19e4 -3.64e5  
## 10 agriculture Guaratinguetá enteric-f… 4.13e4 -3.22e5  
## 11 transportation Guaratinguetá Urban Area in Guara… road-tran… 1.20e5 -2.02e5

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

## # A tibble: 10 × 5  
## sector\_name source\_name sub\_sector emission Cumsum  
## <chr> <chr> <chr> <dbl> <dbl>  
## 1 forestry Ilha Solteira net-shrubgrass -37602. -37602.  
## 2 forestry Ilha Solteira net-forest-land -3944. -41546.  
## 3 agriculture BRA\_beef\_225 manure-management-cattle-feed… 59.6 -41487.  
## 4 forestry Ilha Solteira net-wetland 1019. -40468.  
## 5 waste ETE ILHA SOLTEIRA wastewater-treatment-and-disc… 1645. -38823.  
## 6 agriculture BRA\_beef\_225 enteric-fermentation-cattle-f… 3160. -35663.  
## 7 agriculture Ilha Solteira synthetic-fertilizer-applicat… 11299. -24364.  
## 8 agriculture Ilha Solteira manure-left-on-pasture-cattle 16413. -7951.  
## 9 agriculture Ilha Solteira enteric-fermentation-cattle-p… 57023. 49072.  
## 10 agriculture Ilha Solteira cropland-fires 63412. 112484.

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

## # A tibble: 10 × 5  
## sector\_name source\_name sub\_sector emission Cumsum  
## <chr> <chr> <chr> <dbl> <dbl>  
## 1 forestry Itapeva net-fores… -398537. -3.99e5  
## 2 forestry Itapeva net-wetla… -1109. -4.00e5  
## 3 waste ETE ITAPEVA wastewate… 4585. -3.95e5  
## 4 forestry Itapeva net-shrub… 15928. -3.79e5  
## 5 agriculture Itapeva synthetic… 19316. -3.60e5  
## 6 agriculture Itapeva manure-le… 22336. -3.37e5  
## 7 manufacturing Itapeva cement plant cement 61968. -2.76e5  
## 8 transportation Itapeva Urban Area in Itapeva Mun… road-tran… 75639. -2.00e5  
## 9 agriculture Itapeva enteric-f… 77602. -1.22e5  
## 10 agriculture Itapeva cropland-… 172392. 5.01e4

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

## # A tibble: 9 × 5  
## sector\_name source\_name sub\_sector emission Cumsum  
## <chr> <chr> <chr> <dbl> <dbl>  
## 1 forestry Jaboticabal net-fores… -17490. -17490.  
## 2 forestry Jaboticabal net-shrub… -756. -18246.  
## 3 forestry Jaboticabal net-wetla… -511. -18757.  
## 4 agriculture Jaboticabal manure-le… 965. -17792.  
## 5 agriculture Jaboticabal enteric-f… 3352. -14440.  
## 6 agriculture Jaboticabal synthetic… 3568. -10872.  
## 7 waste ETE JABOTICABAL SP wastewate… 4972. -5900.  
## 8 transportation Jaboticabal Urban Area in Jabotica… road-tran… 98919. 93018.  
## 9 agriculture Jaboticabal cropland-… 904747. 997766.

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

## # A tibble: 0 × 5  
## # ℹ 5 variables: sector\_name <chr>, source\_name <chr>, sub\_sector <chr>,  
## # emission <dbl>, Cumsum <dbl>

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

## # A tibble: 10 × 5  
## sector\_name source\_name sub\_sector emission Cumsum  
## <chr> <chr> <chr> <dbl> <dbl>  
## 1 forestry Ourinhos net-fores… -11393. -11393.  
## 2 forestry Ourinhos net-shrub… -1847. -13240.  
## 3 forestry Ourinhos net-wetla… -1493. -14733.  
## 4 waste ETE RIO PARANAPANEMA wastewate… 2142. -12591.  
## 5 agriculture Ourinhos synthetic… 2571. -10019.  
## 6 agriculture Ourinhos manure-le… 3148. -6871.  
## 7 waste ETE RIO PARDO OURINHOS wastewate… 3959. -2912.  
## 8 agriculture Ourinhos enteric-f… 10938. 8026.  
## 9 transportation Ourinhos Urban Area in Ourinhos M… road-tran… 138011. 146037.  
## 10 agriculture Ourinhos cropland-… 147704. 293741.

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

## # A tibble: 11 × 5  
## sector\_name source\_name sub\_sector emission Cumsum  
## <chr> <chr> <chr> <dbl> <dbl>  
## 1 forestry Presidente Prudente net-shrub… -73747. -73747.  
## 2 forestry Presidente Prudente net-fores… -46684. -120431.  
## 3 forestry Presidente Prudente net-wetla… -109. -120540.  
## 4 agriculture Presidente Prudente synthetic… 3673. -116867.  
## 5 transportation Presidente Prudente Airport domestic-… 9424. -107443.  
## 6 agriculture Presidente Prudente manure-le… 16295. -91149.  
## 7 agriculture Presidente Prudente enteric-f… 56612. -34537.  
## 8 agriculture Presidente Prudente cropland-… 173125. 138588.  
## 9 transportation Presidente Prudente Urban Area i… road-tran… 349056. 487644.  
## 10 waste OpenStreetMap Landfill solid-was… 505406. 993050.  
## 11 transportation Presidente Prudente Airport internati… NaN NaN

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

## # A tibble: 9 × 5  
## sector\_name source\_name sub\_sector emission Cumsum  
## <chr> <chr> <chr> <dbl> <dbl>  
## 1 forestry Registro net-forest-land -1.43e6 -1.43e6  
## 2 forestry Registro net-wetland -3.72e4 -1.47e6  
## 3 forestry Registro net-shrubgrass -2.49e4 -1.49e6  
## 4 agriculture Registro cropland-fires 7.33e2 -1.49e6  
## 5 agriculture Registro synthetic-fertilizer-appl… 8.10e2 -1.49e6  
## 6 waste ETE REGISTRO wastewater-treatment-and-… 2.93e3 -1.49e6  
## 7 agriculture Registro manure-left-on-pasture-ca… 3.39e3 -1.49e6  
## 8 agriculture Registro enteric-fermentation-catt… 1.18e4 -1.48e6  
## 9 waste OpenStreetMap Landfill solid-waste-disposal 1.17e5 -1.36e6

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

## # A tibble: 15 × 5  
## sector\_name source\_name sub\_sector emission Cumsum  
## <chr> <chr> <chr> <dbl> <dbl>  
## 1 forestry Rio Claro net-fores… -26889. -26889.  
## 2 forestry Rio Claro net-wetla… -197. -27086.  
## 3 waste ETE BATOVI wastewate… 61.0 -27025.  
## 4 waste ETE FERRAZ wastewate… 91.5 -26934.  
## 5 waste ETE ASSISTENCIA wastewate… 192. -26741.  
## 6 waste ETE AJAPI wastewate… 305. -26436.  
## 7 waste ETE PALMEIRAS RIO CLARO wastewate… 396. -26040.  
## 8 forestry Rio Claro net-shrub… 572. -25468.  
## 9 waste ETE FLORES wastewate… 2144. -23324.  
## 10 agriculture Rio Claro synthetic… 2868. -20456.  
## 11 agriculture Rio Claro manure-le… 3480. -16976.  
## 12 waste ETE CONDUTA wastewate… 4575. -12401.  
## 13 agriculture Rio Claro enteric-f… 12090. -311.  
## 14 transportation Rio Claro Urban Area in Rio Claro… road-tran… 225819. 225508.  
## 15 agriculture Rio Claro cropland-… 235842. 461350.

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

## # A tibble: 8 × 5  
## sector\_name source\_name sub\_sector emission Cumsum  
## <chr> <chr> <chr> <dbl> <dbl>  
## 1 forestry Rosana net-shrubgrass -29771. -29771.  
## 2 forestry Rosana net-forest-land -5413. -35184.  
## 3 waste ETE ROSANA wastewater-treatment-and-discharge 991. -34193.  
## 4 forestry Rosana net-wetland 2191. -32002.  
## 5 agriculture Rosana synthetic-fertilizer-application 4465. -27536.  
## 6 agriculture Rosana manure-left-on-pasture-cattle 19430. -8106.  
## 7 agriculture Rosana cropland-fires 55343. 47237.  
## 8 agriculture Rosana enteric-fermentation-cattle-pasture 67506. 114744.

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

## # A tibble: 9 × 5  
## sector\_name source\_name sub\_sector emission Cumsum  
## <chr> <chr> <chr> <dbl> <dbl>  
## 1 forestry São João da Boa Vista net-shrub… -10659. -10659.  
## 2 forestry São João da Boa Vista net-fores… -9210. -19869.  
## 3 forestry São João da Boa Vista net-wetla… 46.1 -19823.  
## 4 waste ETE SAO JOAO DA BOA VISTA wastewate… 5684. -14140.  
## 5 agriculture São João da Boa Vista synthetic… 6646. -7494.  
## 6 agriculture São João da Boa Vista manure-le… 7642. 148.  
## 7 agriculture São João da Boa Vista enteric-f… 26551. 26699.  
## 8 agriculture São João da Boa Vista cropland-… 99737. 126436.  
## 9 transportation São João da Boa Vista Urban Area i… road-tran… 123501. 249936.

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

## # A tibble: 14 × 5  
## sector\_name source\_name sub\_sector emission Cumsum  
## <chr> <chr> <chr> <dbl> <dbl>  
## 1 forestry São José do Rio Preto net-shrub… -10853. -10853.  
## 2 forestry São José do Rio Preto net-wetla… 11.2 -10842.  
## 3 agriculture BRA\_beef\_233 manure-ma… 59.6 -10782.  
## 4 forestry São José do Rio Preto net-fores… 262. -10520.  
## 5 agriculture BRA\_beef\_233 enteric-f… 3160. -7360.  
## 6 agriculture São José do Rio Preto synthetic… 6860. -500.  
## 7 agriculture São José do Rio Preto manure-le… 8912. 8412.  
## 8 transportation Prof. Eribelto Manoel Reino Stat… domestic-… 26649. 35061.  
## 9 waste ETE RIO PRETO wastewate… 26877. 61938.  
## 10 agriculture São José do Rio Preto enteric-f… 30963. 92901.  
## 11 agriculture São José do Rio Preto cropland-… 83314. 176215.  
## 12 waste OpenStreetMap Landfill solid-was… 240518. 416733.  
## 13 transportation São José do Rio Preto Urban Area… road-tran… 737454. 1154186.  
## 14 transportation Prof. Eribelto Manoel Reino Stat… internati… NaN NaN

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

## # A tibble: 16 × 5  
## sector\_name source\_name sub\_sector emission Cumsum  
## <chr> <chr> <chr> <dbl> <dbl>  
## 1 forestry São José dos Campos net-fores… -520453. -520453.  
## 2 forestry São José dos Campos net-shrub… -37728. -558182.  
## 3 forestry São José dos Campos net-wetla… -699. -558881.  
## 4 waste ETE VISTA VERDE wastewate… 1024. -557856.  
## 5 waste ETE URBANOVA wastewate… 1628. -556229.  
## 6 agriculture São José dos Campos synthetic… 9191. -547038.  
## 7 waste ETE PARARANGABA wastewate… 9473. -537566.  
## 8 agriculture São José dos Campos manure-le… 11447. -526119.  
## 9 forestry Jaguari water-res… 12550. -513569.  
## 10 agriculture São José dos Campos cropland-… 13178. -500391.  
## 11 waste ETE LAVAPeS wastewate… 26054. -474338.  
## 12 agriculture São José dos Campos enteric-f… 39769. -434568.  
## 13 transportation Sao Jose dos Campos Urban Area i… road-tran… 766412. 331844.  
## 14 fossil Petrobras REVAP (Henrique Lage) … oil-and-g… 3025107. 3356951.  
## 15 transportation Professor Urbano Ernesto Stumpf … domestic-… NaN NaN   
## 16 transportation Professor Urbano Ernesto Stumpf … internati… NaN NaN

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

## # A tibble: 15 × 5  
## sector\_name source\_name sub\_sector emission Cumsum  
## <chr> <chr> <chr> <dbl> <dbl>  
## 1 transportation Polvilho Urban Area in São Paulo… road-tran… 1797. 1.80e3  
## 2 waste ETE SAO MIGUEL SAO PAULO wastewate… 7724. 9.52e3  
## 3 waste ETE ABC wastewate… 8932. 1.85e4  
## 4 forestry Guarapiranga water-res… 9889. 2.83e4  
## 5 transportation Perus Urban Area in São Paulo Mu… road-tran… 38425. 6.68e4  
## 6 forestry Billings water-res… 41716. 1.08e5  
## 7 transportation Jardim Britânia Urban Area in Sã… road-tran… 69599. 1.78e5  
## 8 waste ETE PARQUE NOVO MUNDO wastewate… 105795. 2.84e5  
## 9 waste OpenStreetMap Landfill solid-was… 243171. 5.27e5  
## 10 power Piratininga power station electrici… 420000 9.47e5  
## 11 power Nova Piratininga power station electrici… 669000 1.62e6  
## 12 transportation Congonhas Airport domestic-… 955019. 2.57e6  
## 13 waste Bandeirantes solid-was… 2469936. 5.04e6  
## 14 transportation São Paulo Urban Area in São Paul… road-tran… 9272765. 1.43e7  
## 15 transportation Congonhas Airport internati… NaN NaN

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

## # A tibble: 9 × 5  
## sector\_name source\_name sub\_sector emission Cumsum  
## <chr> <chr> <chr> <dbl> <dbl>  
## 1 forestry São Vicente net-fores… -1.38e5 -1.38e5  
## 2 forestry São Vicente net-wetla… -2.55e3 -1.40e5  
## 3 forestry São Vicente net-shrub… -1.77e2 -1.40e5  
## 4 agriculture São Vicente synthetic… 1.10e1 -1.40e5  
## 5 waste ETE HUMAITA SAO VICENTE wastewate… 1.63e3 -1.39e5  
## 6 waste ETE SAMARITA wastewate… 1.63e3 -1.37e5  
## 7 waste Rodovia Padre Manoel Da Nóbrega, P… solid-was… 3.21e3 -1.34e5  
## 8 transportation Praia Grande Urban Area in São Vic… road-tran… 5.18e4 -8.20e4  
## 9 transportation Santos Urban Area in São Vicente M… road-tran… 1.50e5 6.82e4

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

## # A tibble: 18 × 5  
## sector\_name source\_name sub\_sector emission Cumsum  
## <chr> <chr> <chr> <dbl> <dbl>  
## 1 forestry Sorocaba net-fores… -43743. -4.37e4  
## 2 forestry Sorocaba net-shrub… -7212. -5.10e4  
## 3 forestry Sorocaba net-wetla… -398. -5.14e4  
## 4 waste ETE IPANEMINHA wastewate… 16.6 -5.13e4  
## 5 waste ETE QUINTAIS DO IMPERADOR wastewate… 241. -5.11e4  
## 6 waste ETE APARECIDINHA wastewate… 756. -5.03e4  
## 7 agriculture Sorocaba manure-le… 1326. -4.90e4  
## 8 waste ETE GUIMARAES wastewate… 2423. -4.66e4  
## 9 agriculture Sorocaba cropland-… 4351. -4.22e4  
## 10 agriculture Sorocaba enteric-f… 4608. -3.76e4  
## 11 waste ETE PITICO wastewate… 4623. -3.30e4  
## 12 waste ETE S 2 wastewate… 5711. -2.73e4  
## 13 agriculture Sorocaba synthetic… 6155. -2.11e4  
## 14 waste ETE ITANGUA wastewate… 6799. -1.43e4  
## 15 waste ETE S 1 wastewate… 16953. 2.61e3  
## 16 manufacturing Sorocaba aluminium plant aluminum 72221 7.48e4  
## 17 waste OpenStreetMap Landfill solid-was… 388597. 4.63e5  
## 18 transportation Sorocaba Urban Area in Sorocaba M… road-tran… 841687. 1.31e6

## `summarise()` has grouped output by 'sector\_name', 'source\_name'. You can  
## override using the `.groups` argument.

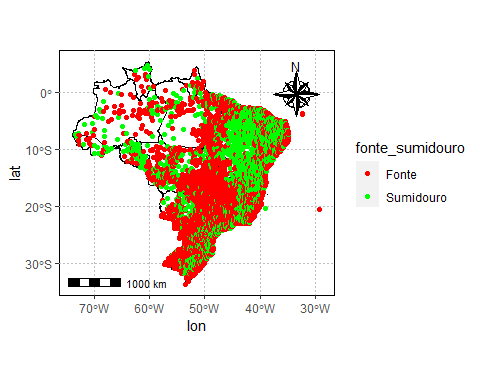
## # A tibble: 9 × 5  
## sector\_name source\_name sub\_sector emission Cumsum  
## <chr> <chr> <chr> <dbl> <dbl>  
## 1 forestry Tupã net-shrub… -92165. -9.22e4  
## 2 forestry Tupã net-fores… -62778. -1.55e5  
## 3 forestry Tupã net-wetla… -298. -1.55e5  
## 4 waste ETE TUPA wastewate… 4328. -1.51e5  
## 5 agriculture Tupã synthetic… 11903. -1.39e5  
## 6 agriculture Tupã manure-le… 21022. -1.18e5  
## 7 agriculture Tupã cropland-… 51058. -6.69e4  
## 8 agriculture Tupã enteric-f… 73036. 6.11e3  
## 9 transportation Tupã Urban Area in Tupã Municipali… road-tran… 84390. 9.05e4

states %>%  
 #filter(name\_state == "São Paulo") |>   
 ggplot() +  
 geom\_sf(fill="white", color="black",  
 size=.15, show.legend = FALSE) +  
 geom\_point(  
 data = emissions\_sources %>%   
 filter(#str\_detect(city\_ref,str\_c(cidades\_unesp,collapse = "|")),  
 #sigla\_uf == "SP",  
 year == 2022,  
 gas == "co2e\_100yr",  
 !source\_name %in% nomes\_uf,  
 !sub\_sector %in% c("forest-land-clearing",  
 "forest-land-degradation",  
 "shrubgrass-fires",  
 "forest-land-fires",  
 "wetland-fires",  
 "removals")  
 ) %>%   
 group\_by(lon,lat,city\_ref) %>%   
 summarise(  
 emission = sum(emissions\_quantity, na.rm=TRUE)  
 ) %>%   
 mutate(  
 fonte\_sumidouro = ifelse(emission <=0, "Sumidouro","Fonte")  
 ),  
 aes(lon,lat,color=fonte\_sumidouro)) +  
 scale\_color\_manual(values = c("red","green"))+  
 tema\_mapa()

## `summarise()` has grouped output by 'lon', 'lat'. You can override using the  
## `.groups` argument.

## Warning: Removed 1 rows containing missing values (`geom\_point()`).

## Scale on map varies by more than 10%, scale bar may be inaccurate



ano <- 2013:2022  
for(i in seq\_along(ano)){  
 plot\_unesp <- emissions\_sources %>%   
 filter(str\_detect(city\_ref,str\_c(cidades\_unesp,collapse = "|")),  
 sigla\_uf == "SP",  
 year == ano[i],  
 gas == "co2e\_100yr",  
 !source\_name %in% nomes\_uf,  
 !sub\_sector %in% c("forest-land-clearing",  
 "forest-land-degradation",  
 "shrubgrass-fires",  
 "forest-land-fires",  
 "wetland-fires",  
 "removals")  
 ) %>%   
 group\_by(city\_ref) %>%   
 summarise(  
 emission = sum(emissions\_quantity, na.rm=TRUE)  
 ) %>%   
 mutate(  
 city\_ref = city\_ref %>% fct\_reorder(emission),  
 fonte\_sumidouro = ifelse(emission <=0, "Sumidouro","Fonte"),  
 ) %>%  
 ggplot(aes(x=city\_ref, y= emission, fill=fonte\_sumidouro))+  
 geom\_col(color="black") +  
 coord\_flip() +  
 theme\_bw() +  
 labs(title = paste("UNESP-Cidades (",ano[i],")"),  
 y="(emission)") +  
 scale\_fill\_manual(values = c("red","green"))  
 print(plot\_unesp)  
 }

