

Setup GloWPa input directory

```
devtools::load_all()
```

```
## i Loading glowpa
```

```
dir.create("glowpa/input/population", showWarnings = FALSE, recursive = TRUE)
dir.create("glowpa/output", showWarnings = FALSE, recursive = TRUE)
```

Scenario options

```
gadm_level <- 2
pathogen <- "rotavirus"
```

Create Raster

```
vect_gadm <- terra::vect("default/geodata/geodata.shp")
# make numbers
vect_gadm[["iso"]] <- 1:nrow(vect_gadm)

rast_domain <- terra::rast(resolution = .5)
rast_iso <- terra::trim(
  terra::rasterize(vect_gadm, rast_domain, field = "iso", touches = TRUE)
)

terra::writeRaster(rast_iso, "glowpa/input/isoraster.tif", overwrite = TRUE)
```

Create Gridded Population

Note: this should added to the waterpath data service.

```
rast_pop_urban <- terra::rast("../.../inst/extdata/global/human/pop_urban.tif")
rast_pop_rural <- terra::rast("../.../inst/extdata/global/human/pop_rural.tif")

rast_pop_urban_default <- terra::crop(rast_pop_urban, rast_iso, mask = TRUE)
rast_pop_rural_default <- terra::crop(rast_pop_rural, rast_iso, mask = TRUE)

terra::writeRaster(
  rast_pop_urban_default, "glowpa/input/population/pop_urban.tif", overwrite = TRUE)
terra::writeRaster(
  rast_pop_rural_default, "glowpa/input/population/pop_rural.tif", overwrite = TRUE)
```

Create Isodata

```
df_population <- read.csv("default/population.csv", sep = ",")
df_sanitation <- read.csv("default/sanitation.csv", sep = ",")
df_population %>%
  dplyr::mutate_if(is.numeric, format, digits = 3, scientific = TRUE)
```

iso	gid	iso3	subarea	hdi	population	fraction_urban_pop	fraction_pop_under5
GRC.1.1_1	GRC.1.1_1	GRC	North Aegean	8.93e-01	179523	3.37e-01	4.2e-02
GRC.1.2_1	GRC.1.2_1	GRC	South Aegean	8.93e-01	303711	4.38e-01	4.2e-02

```
gid_col <- sprintf("GID_%s", gadm_level)

df_population <- df_population %>% dplyr::rename(iso_country = "iso3")
df_sanitation <- df_sanitation %>%
  dplyr::rename(iso_country = "alpha3",
                onsiteDumpedland_rur = "onsiteDumpedLand_rur",
                onsiteDumpedland_urb = "onsiteDumpedLand_urb")
df_gadm <- as.data.frame(vect_gadm) %>% dplyr::select(iso, dplyr::one_of(gid_col))

join_by = dplyr::join_by(!sym(gid_col) == iso)
df_isodata <- df_gadm %>%
  dplyr::left_join(df_population, by = join_by ) %>%
  dplyr::left_join(df_sanitation, by = "iso_country")

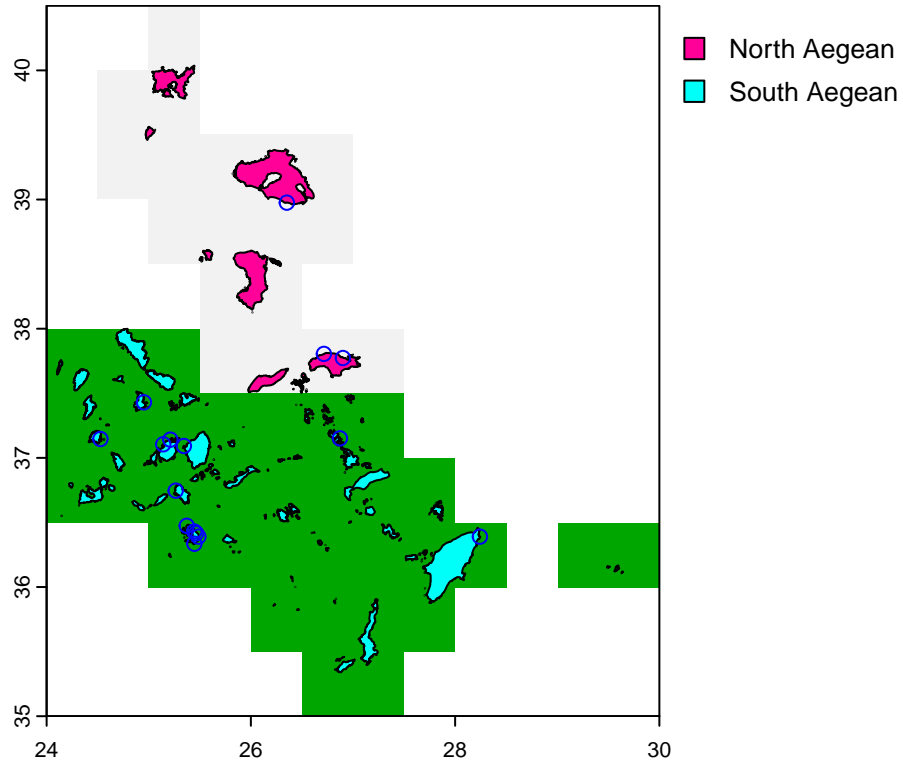
saveRDS(df_isodata, "glowpa/input/isodata.RDS")
```

Create Treatment Data

```
df_treatment <- read.csv("default/treatment.csv", sep = ",")
df_treatment <- df_treatment %>% dplyr::mutate(
  treatment_type = stringr::str_to_title(treatment_type)
)
saveRDS(df_treatment, "glowpa/input/wwtp.RDS")
```

Make Map

```
vect_treatment <- terra::vect(df_treatment, geom = c("lon", "lat"))
terra::plot(rast_iso, legend = FALSE)
terra::plot(vect_gadm, "NAME_2", add = TRUE)
terra::plot(vect_treatment, col = "blue", pch = 1, add = TRUE)
```



Make the configuration file

```
list_config = list(
  input = list(
    isoraster = "input/isoraster.tif",
    isodata = "input/isodata.RDS",
    wwtp = "input/wwtp.RDS",
    population = list(
      urban = "input/population/pop_urban.tif",
      rural = "input/population/pop_rural.tif"
    )
  ),
  pathogen = pathogen,
  wwtp = list(
    treatment = "POINT"
  ),
  logger = list(
    enabled = TRUE,
    threshold = "INFO",
    appender = "CONSOLE"
  ),
  output = list(
    dir = "output"
  )
)

response = configr::write.config(list_config, "glowpa/default.yaml", write.type = "yaml")
```

Run GloWPa

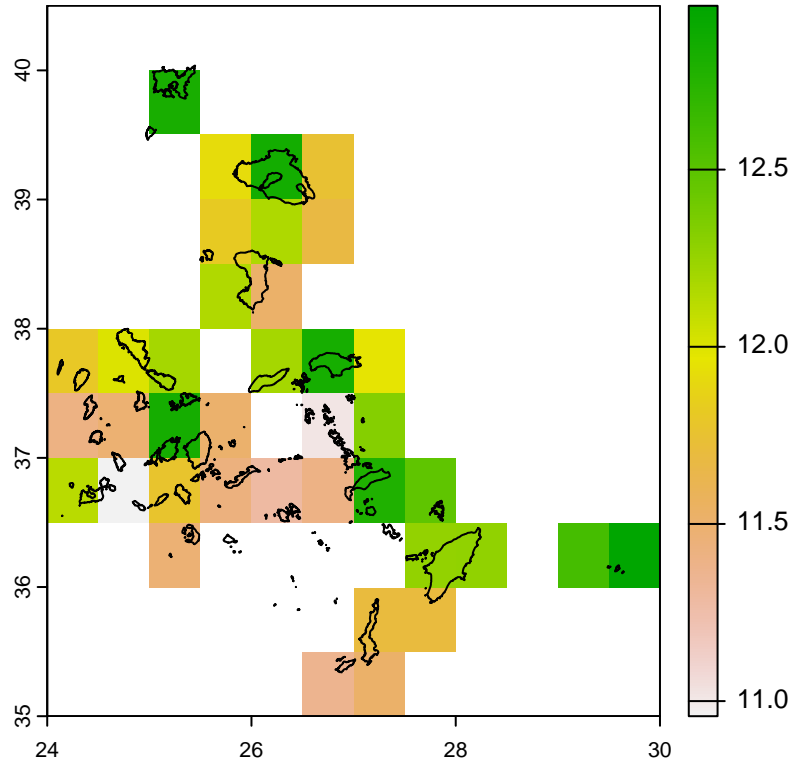
```
wd <- getwd()
setwd("glowpa")

glowpa::glowpa_init("default.yaml")
glowpa::glowpa_start()
setwd(wd)
```

Make Plots

Loads showed in log10 transformation

```
glowpa_run <- glowpa::glowpa_get_run()
df_human_sources <- read.csv(
  file.path("glowpa/output", glowpa_run$settings$output$sources$human$surface_water))
vect_human_sources <- terra::merge(vect_gadm, df_human_sources, by = "iso")
rast_surface_water <- terra::rast(
  file.path("glowpa/output", glowpa_run$settings$output$sinks$surface_water$grid))
terra::plot(log10(rast_surface_water))
terra::plot(vect_gadm, add = TRUE)
```



Loads in Sinks

Loads showed in log10 transformation

```
df_sinks <- read.csv(
  file.path("glowpa/output", glowpa_run$settings$output$sinks$surface_water$table)) %>%
  dplyr::mutate_at(
    .vars = c("humans", "land", "wwtp"), .funs = log10
  )
df_sinks
```

iso	humans	land	wwtp
1	13.45878	8.951446	10.70332
2	13.63303	9.147552	11.87863

Human Attribution

Loads showed in log10 transformation

```
table_human_sources <- df_human_sources %>%
  dplyr::mutate_at(.vars = glowpa:::CONSTANTS$SANITATION_TYPES, .funs = log10) %>%
  dplyr::mutate_if(is.numeric, format, digits = 4, scientific = TRUE) %>%
  dplyr::rename_with(~ stringr::str_trunc(.x, 10))

table_human_sources %>% dplyr::select(iso, 2:8)
```

iso	bucketL...	compost...	contain...	flushOpen	flushPit	flushSe...	flushSewer
1	-Inf	-Inf	-Inf	-Inf	-Inf	1.151e+01	1.345e+01
2	-Inf	-Inf	-Inf	-Inf	-Inf	1.171e+01	1.364e+01

```
table_human_sources %>% dplyr::select(iso, 9:14)
```

iso	flushUn...	hanging...	openDef...	other	pitNoSlab	pitSlab
1	-Inf	-Inf	-Inf	-Inf	-Inf	-Inf
2	-Inf	-Inf	-Inf	-Inf	-Inf	-Inf