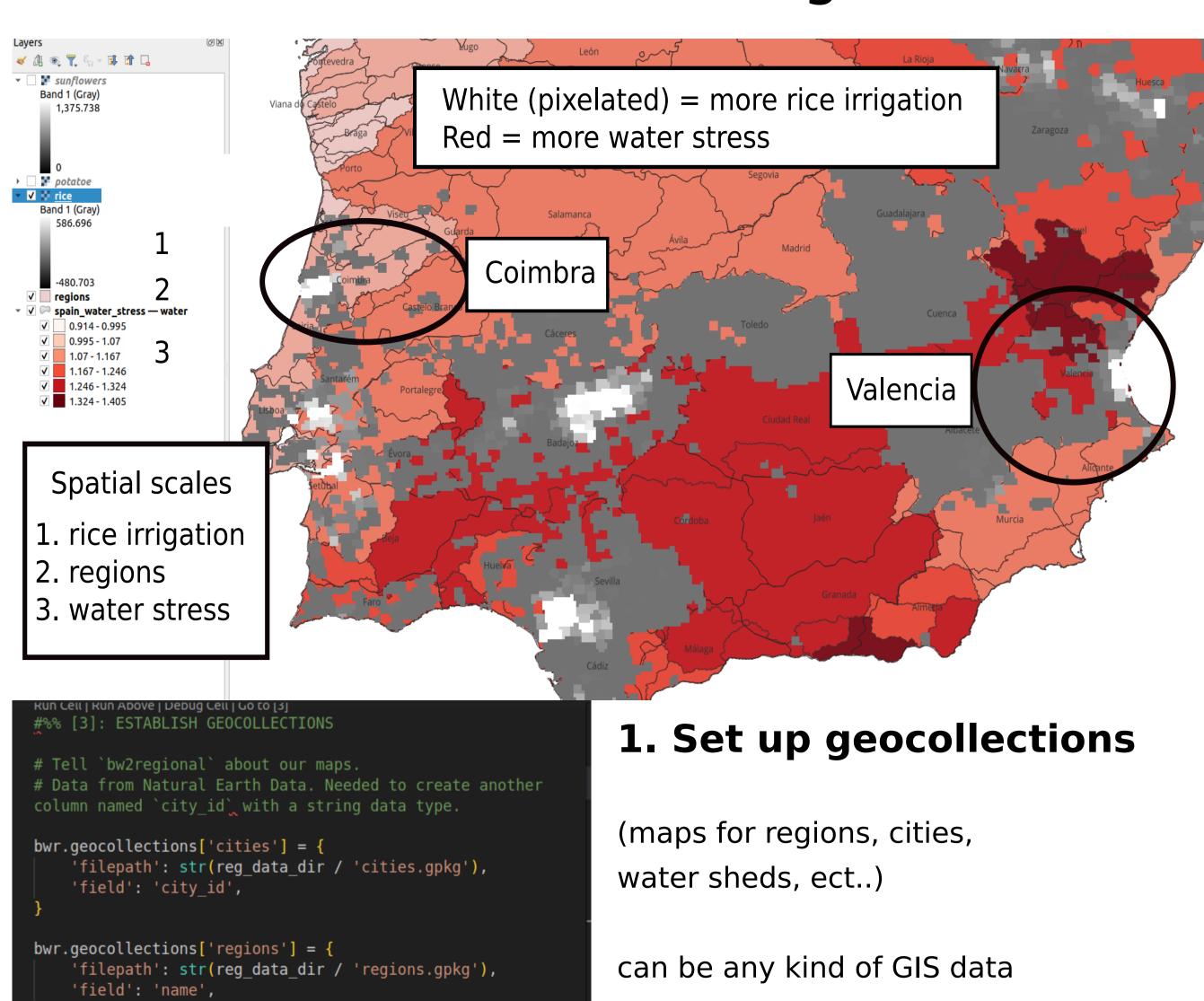
a simple example of spatiotemporal LCA in bw2:

water stress from eating Iberian rice



'field': 'basin_id', gdal_rasterize -a IR_rice -init -999 -a_nodata -999 -ts 400 400 -of GTIFF irrigation.gpkg rice.p.tiff gdalwarp -t_srs EPSG:4326 rice.p.tiff rice.tiff CROPS = ['cereals', 'citrus', 'rice', 'potatoe'] for crop in CROPS: bwr.geocollections[crop] = {'filepath': str (reg_data_dir / f'{crop}.tiff'), 'nodata': -999}

'filepath': str(reg_data_dir / 'countries.gpkg'),

'filepath': str(data_dir / 'wsi_annual_spain.gpkg'),

bwr.geocollections['countries'] = {

bwr.geocollections['WaterGap'] = {

'field': 'NAME',

#%% [4]: SETUP DATABASES # biosphere with only water bio = bd.Database("biosphere") bio.register() water = bio.new node(code="water", name="water", type="emission", water.save() technosphere with only rice and a meal food = bd.Database("food") food.register() rice_Valencia = food.new_node(code="rice Valencia", name="rice Valencia", location=('regions', 'Valencia') rice Valencia.save() rice Valencia.new edge(input=water, amount=12, type="biosphere", temporal distribution=TD(amount=np.ones(12), date=np.linspace(-12, 0, 12, dtype="timedelta64[M]", endpoint=False))).save() # make one in a different region rice_Coimbra = food.new_node(code="rice_Coimbra", name="rice Coimbra",

 6 m^3

Water

<---- political boundaries

2. Process geospatial data

<---- water stress for spain

(in the terminal)

in this case:

"Estimation of spatial distribution of irrigated crop areas in Europe

for large-scale modelling applications"

In this case:

3. Set up the system models

biosphere with only water

1 kg

and

technosphere with only rice and a meal + one extra source of rice production

<-- Temporal distributions:

to show some differences

amount = np.array(x, y, z)

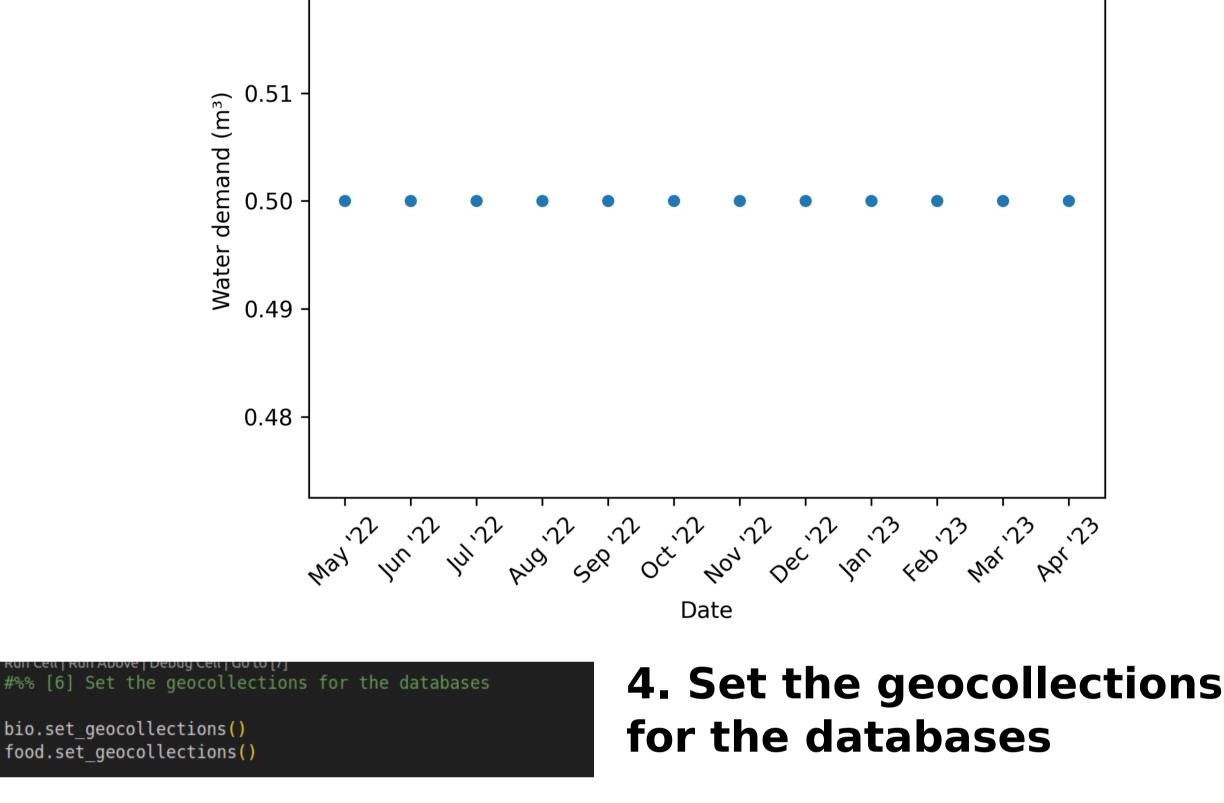
time = np.array(t1, t2, t2, dtype=time)

Delicious meal



Rice

0.52



%% [8]: WRITE LCIA METHODS

GLOBAL CF = 0.44 # end result from processing the maps

with fiona.open(data_dir / 'wsi_annual_spain.

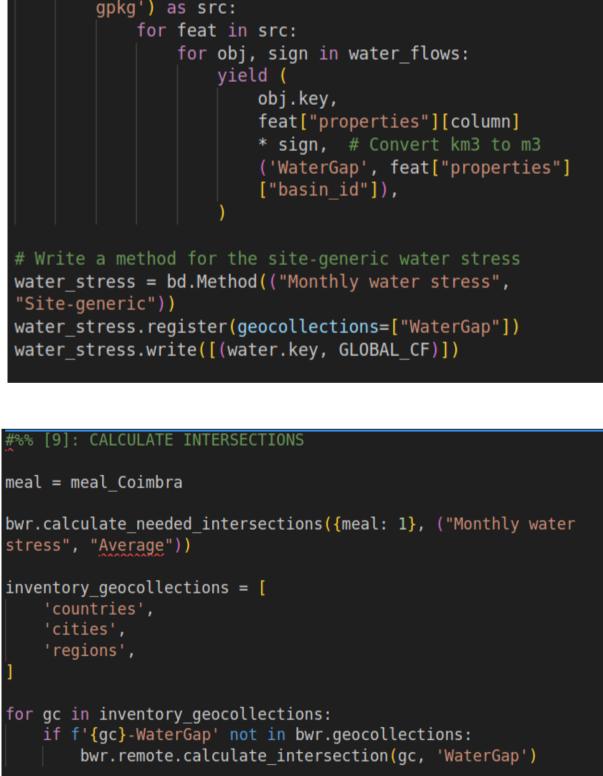
water_flows = [(bd.get_node(name="water"), 1)]

function to read the data from the geopackage

inside another table in that HTML (!!).

def gpkg_reader(column): with fiona.Env():

Data is stored inside an attribute called `description`, which is HTML (!). Even better, the data is inside a table



(can be troublesome) 6. Write LCIA methods

5. Process LCIA maps to

get regionalised CFs

in this case: Global CF (when data lacks)

+ Site generic

+Month specific

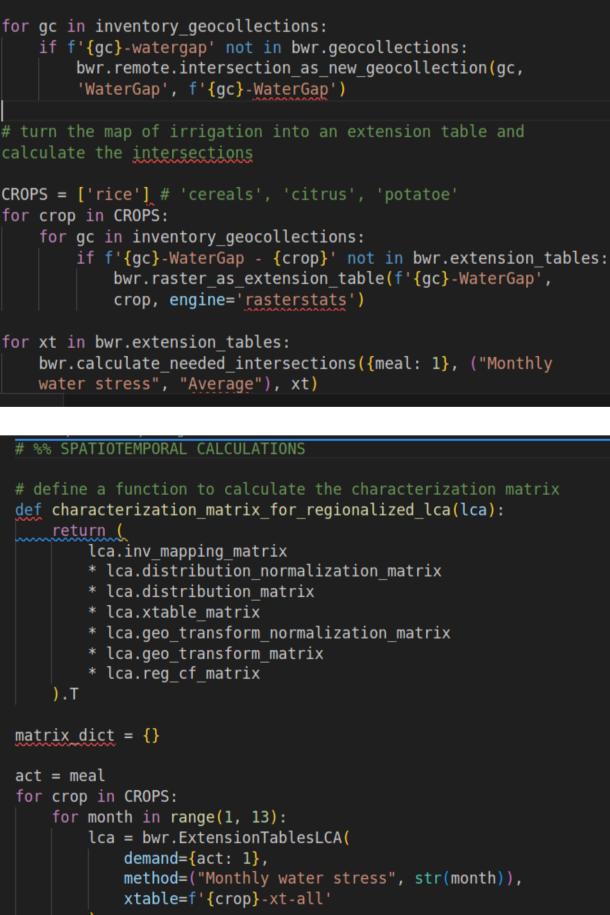
7. Calculate Intersections

of geodata

Site specific

What are the values there? Let's make a weighted average...

Where do all the maps overlap?



lca.lci() lca.lcia()

@classmethod

Run Cell | Run Above | Debug Cell

3.5

0.5

0.0

M1.22

AUG 22

serizi

matrix_dict[(crop, month)] =

[12]: CALCULATE REGIONALISED LCA

%% [13image.png]: CALCULATE TEMPORALIS LCA

class RegionalizedGraphTraversal(GraphTraversal):

(lca).multiply(lca.biosphere_matrix)

characterization_matrix_for_regionalized_lca(lca)

def get_characterized_biosphere(cls, lca: bc.LCA):

return characterization matrix for regionalized lca

b. make char, matrices

8. Spatiotemporal calcs.

with CFs specific for each month and location

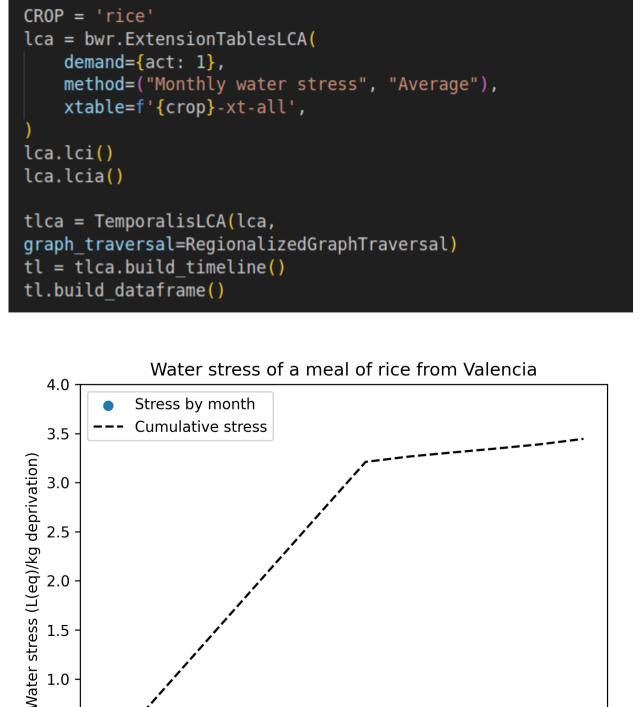
a. Define characterisation

matrices for reg. LCIA

a. using RegionalizedGraphTraversal to get a characterised biosphere

9. Almost, some results...

b. using TemporalisLCA to include the effects of temporally distributed activities/impacts



are the impacts of your meal? or

Where and when should you buy your (iberian) rice? (if you care about the impacts on water stress)

10. What/where/when

(units: L(eq)/kg deprivation of water downstream) From Valencia?

high impacts from Jun-Nov (overall impact \sim 3.5 L(eq)/kg)

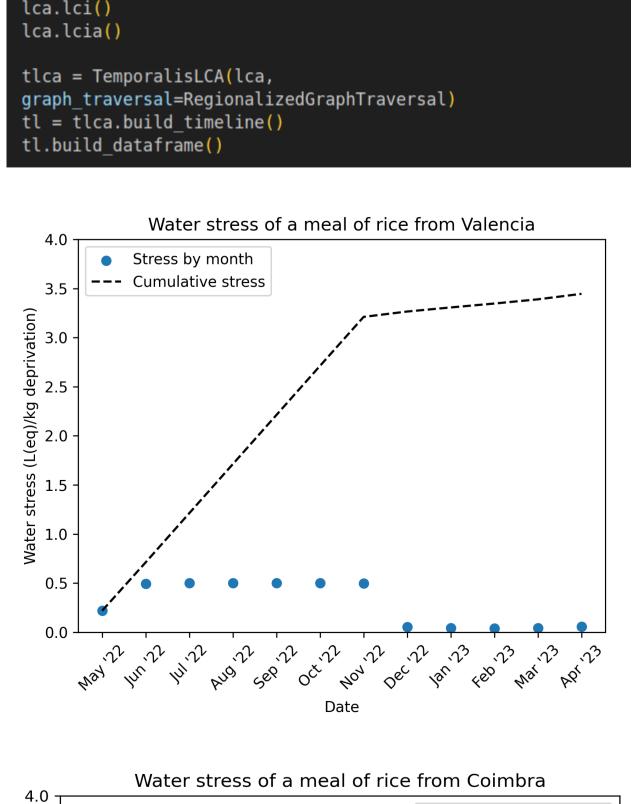
From Coimbria?

better, except for Oct (overall impact \sim 2.5 L(eq)/kg)

Interersting and powerful functions,

but obviously... Caveat utilitor

Be very careful that your data was processed correctly, makes sense, and is not misleading you



Stress by month Cumulative stress

Jec 22

181,33

404.52

Date

0c1.22