R-tools

Ran at 2015-07-24 05:24:26

> wiki_username <- "Jouni"
> server <- TRUE
> ### THIS CODE IS FROM PAGE [[Climate change policies and health in Kuopio]] (Op_en5461, code_name = "")
> library(OpasnetUtils)
> library(ggplot2)
> ### Technical parameters
> openv.setN(0) # use medians instead of whole sampled distributions
> objects.latest("Op_en6007", code_name = "answer") # [[OpasnetUtils/Drafts]] findrest
> BS <- 24 # base size = font size in graphs
> figstofile <- FALSE
> saveobjects <- TRUE
> finnish <- FALSE
> suomenna <- function(ova) {
+ if(class(ova) == "ovariable") out <- ova@output else out <- ova
+ if("Heating" %in% colnames(out)) {
+ out$Heating <- as.factor(out$Heating)
+ levels(out$Heating)[levels(out$Heating) == "District heating"] <- "District"
+ }
+ if("Response" %in% colnames(out)) {
+ out$Response <- as.factor(out$Response)
+ levels(out$Response)[levels(out$Response) == "Cardiopulmonary mortality"] <- "Cardiopulmonary"
+ }
+ if("Pollutant" %in% colnames(out)) {
+ out$Pollutant <- as.factor(out$Pollutant)
+ levels(out$Pollutant)[levels(out$Pollutant) == "CO2trade"] <- "CO2official"
+ }
+ out$Time <- as.numeric(as.character(out$Time))
+ return(out)
+ }
> obstime <- Ovariable("obstime", data = data.frame(Obsyear = factor(seq(1920, 2050, 10), ordered = TRUE), Result = 1))
> ## Additional index needed in followup of ovariables efficiencyShares and stockBuildings
> }
> >> Additional decisions
> decisions <- oopbase.data("Op_en5461", subset = "Decisions") # [[Climate change policies and health in Kuopio]]
> DecisionTableParser(decisions)
> # Remove previous decisions, if any.
> forgetDecisions <- function() {
+ for(i in ls(envir = openv)) {
+ if("dec_check" %in% names(openv[i]))) openv[[i]$dec_check <- FALSE
+ }
+ return(cat("Decisions were forgotten.
"))
+ }
> forgetDecisions()

Decisions were forgotten.

> ################################ IMPORT DATA AND MODELS
> objects.latest("Op_en5417", code_name = "initiate") # [[Population of Kuopio]]
> # population: City_area
> objects.latest("Op_en5932", code_name = "initiatetest") # [[Building stock in Kuopio]] Building ovariables:
> # buildingStock: Building, Constructed, City_area
> # rateBuildings: Age, (RenovationPolicy)
> # renovationShares: Renovation
> # construction: Building
> # constructionAreas: City_area
> # buildingTypes: Building, Building2
> # heatingShares: Building, Heating, Eventyear
> # heatingSharesNew: Building2, Heating
> # eventyear: Constructed, Eventyear
> # actualBuilding: Actual building model
> # The building stock is measured as m^2 floor area.
> objects.latest("Op_en6289", code_name = "buildingstest") # [[Building model]] # Generic building model.
> # Energy and emissions
> objects.latest("Op_en5488", code_name = "energyUseAnnual") # [[Energy use of buildings]] energyUse
> objects.latest("Op_en5488", code_name = "efficiencyShares") # [[Energy use of buildings]]
> objects.latest("Op_en2791", code_name = "emissionFactors") # [[Emission factors for burning processes]]
> objects.latest("Op_en7328", code_name = "emissionLocations") # [[Kuopio energy production]]
> objects.latest("Op_en7328", code_name = "fuelShares") # [[Kuopio energy production]]
> objects.latest("Op_en5141", code_name = "fuelUse") # [[Energy balance]]
> ## Exposure
> objects.latest("Op_en5813", code_name = "exposure") # [[Intake fractions of PM]] uses Humbert iF as default.
> > objects.latest("Op_en2261", code_name = "fuelShares") # [[Health impact assessment]]
> > objects.latest("Op_en5461", code_name = "DALys") # [[Climate change policies and health in Kuopio]]
> > frexposed <- 1 # fraction of population that is exposed
> bgexposure <- 0 # Background exposure to an agent (a level below which you cannot get in practice)
> BW <- 70 # Body weight (is needed for RR calculations although it is irrelevant for PM2.5)
> > CALCULATIONS
> renovationRate <- EvalOutput(renovationRate) * 10 # Rates for 10-year periods
> > colnames(renovationShares@output) <- "Age"
> > renovationShares <- EvalOutput(renovationShares)
> > colnames(renovationShares@output) <- "Startyear"
> > stockBuildings <- EvalOutput(stockBuildings)
> > stockBuildings <- oapply(stockBuildings, cols = c("City_area"), FUN = sum)
> > changeBuildings <- EvalOutput(changeBuildings)
> > exposure <-EvalOutput(exposure)
> > exposure@output <- exposure@output[exposure@output$Area == "Average",] # Kuopio is an average area,
> > # rather than rural or urban.
> > totcases <- EvalOutput(totcases)
> > totcases <- oapply(totcases, cols = c("Age", "Sex"), FUN = sum)
> > DALYs <- EvalOutput(DALYs)
> > ### GRAPHS AND OUTPUTS
> > bui <- suomenna(oapply(buildings * 1E-6, cols = c("City_area", "buildingsSource"), FUN = sum))
> > ggplot(subset(bui, RenovationPolicy == "BAU" & EfficiencyPolicy == "BAU"), aes(x = Time, weight = buildingsResult, fill = Heating)) + geom_bar(binwidth = 5) + theme_gray(base_size = BS) + labs(
+ title = "Building stock in Kuopio by renovation policy",
+ x = "Time",
+ y = "Floor area (M m2)"
+ )
> if(figstofile) ggsave("Figure3.eps", width = 8, height = 7)
> ggplot(subset(bui, RenovationPolicy == "BAU"), aes(x = Time, weight = buildingsResult, fill = Efficiency)) + geom_bar(binwidth = 5) + facet_grid( ~ EfficiencyPolicy) + theme_gray(base_size = BS) + labs(
+ title = "Building stock in Kuopio by efficiency policy",
+ x = "Time",
+ y = "Floor area (M m2)"
+ )
> ggplot(subset(bui, RenovationPolicy == "BAU" & EfficiencyPolicy == "BAU"), aes(x = Time, weight = buildingsResult, fill = Building)) + geom_bar(binwidth = 5) + theme_gray(base_size = BS) + labs(
+ title = "Building stock in Kuopio",
+ x = "Time",
+ y = "Floor area (M m2)"
+ )
> ggplot(subset(bui, RenovationPolicy == "BAU", EfficiencyPolicy == "BAU"), aes(x = Time, weight = buildingsResult, fill = Heating)) + geom_bar(binwidth = 5) + theme_gray(base_size = BS) + labs(
+ title = "Building stock in Kuopio",
+ x = "Time",
+ y = "Floor area (M m2)"
+ )
> ggplot(subset(bui, RenovationPolicy == "BAU", EfficiencyPolicy == "BAU"), aes(x = Time, weight = buildingsResult, fill = Heating)) + geom_bar(binwidth = 5) + theme_gray(base_size = BS) + labs(
+ title = "Building stock in Kuopio",
+ x = "Time",
+ y = "Floor area (M m2)"
+ )
5) + facet_wrap(~ RenovationPolicy) + theme_gray(base_size = BS) + labs( + title = "Energy used in heating in Kuopio", + x = "Time", + y = "Heating energy (GWh /a)"
+) > if(figstofile) ggsave("Figure4.eps", width = 11, height = 7)
> ggplot(suomenna(energyUse), aes(x = Time, weight = energyUseResult * 1E-6, fill = Heating)) + geom_bar(binwidth = 5) + facet_grid(EfficiencyPolicy ~ RenovationPolicy) + theme_gray(base_size = BS) + labs( + title = "Energy used in heating in Kuopio", + x = "Time", + y = "Heating energy (GWh /a)"
+
> emis <- suomenna(truncateIndex(emissions, cols = "Fuel", bins = 5))
> ggplot(subset(emis, EfficiencyPolicy == "BAU" & RenovationPolicy == "BAU" & Pollutant != "CO2eq"), aes(x = Time, weight = emissionsResult, fill = Fuel)) + geom_bar(binwidth = 5) + facet_grid(Pollutant ~ FuelPolicy, scale = "free_y") + theme_gray(base_size = BS) + labs( + title = "Emissions from heating in Kuopio", + x = "Time", + y = "Emissions (ton /a)"
+
> ggplot(subset(emis, EfficiencyPolicy == "BAU" & FuelPolicy == "BAU"), aes(x = Time, weight = emissionsResult, fill = Emission_site)) + geom_bar(binwidth = 5) + facet_grid(Pollutant ~ RenovationPolicy, scale = "free_y") + theme_gray(base_size = BS) + labs( + title = "Emissions from heating in Kuopio", + x = "Time", + y = "Emissions (ton /a)"
+
> ggplot(subset(suomenna(exposure), RenovationPolicy == "BAU" & EfficiencyPolicy == "BAU" & FuelPolicy == "BAU"), aes(x = Time, weight = exposureResult, fill = Heating)) + geom_bar(binwidth = 5) + facet_grid(Area ~ Emission_height) + theme_gray(base_size = BS) + labs( + title = "Exposure to PM2.5 from heating in Kuopio", + x = "Time", + y = "Average PM2.5 (µg/m3)"
+
> ggplot(subset(suomenna(exposure), EfficiencyPolicy == "BAU"), aes(x = Time, weight = exposureResult, fill = Heating)) + geom_bar(binwidth = 5) + facet_grid(FuelPolicy ~ RenovationPolicy) + theme_gray(base_size = BS) + labs( + title = "Exposure to PM2.5 from heating in Kuopio", + x = "Time", + y = "Average PM2.5 (µg/m3)"
+
> ggplot(subset(suomenna(totcases), EfficiencyPolicy == "BAU"), aes(x = Time, weight = totcasesResult, fill = Heating)) + geom_bar(binwidth = 5) + facet_grid(Response ~ RenovationPolicy) + theme_gray(base_size = BS) + labs( + title = "Health effects of PM2.5 from heating in Kuopio", + x = "Time", + y = "Health effects (deaths /a)"
+
> cat("Total DALYs/a by different combinations of policy options.
"
Total DALYs/a by different combinations of policy options.
>
<table>
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<th>Time</th>
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121 2000.00 | BAU | Active renovation | Biofuel increase | 50.07  
122 2010.00 | BAU | Active renovation | Biofuel increase | 51.08  
123 2020.00 | BAU | Active renovation | Biofuel increase | 46.89  
124 2030.00 | BAU | Active renovation | Biofuel increase | 44.26  
125 2040.00 | BAU | Active renovation | Biofuel increase | 42.73  
126 2050.00 | BAU | Active renovation | Biofuel increase | 42.09  
127 1920.00 | Active efficiency | Active renovation | Biofuel increase | 139.77  
128 1930.00 | Active efficiency | Active renovation | Biofuel increase | 179.32  
129 1940.00 | Active efficiency | Active renovation | Biofuel increase | 222.64  
130 1950.00 | Active efficiency | Active renovation | Biofuel increase | 304.28  
131 1960.00 | Active efficiency | Active renovation | Biofuel increase | 357.78  
132 1970.00 | Active efficiency | Active renovation | Biofuel increase | 321.03  
133 1980.00 | Active efficiency | Active renovation | Biofuel increase | 134.56  
134 1990.00 | Active efficiency | Active renovation | Biofuel increase | 76.35  
135 2000.00 | Active efficiency | Active renovation | Biofuel increase | 50.07  
136 2010.00 | Active efficiency | Active renovation | Biofuel increase | 51.08  
137 2020.00 | Active efficiency | Active renovation | Biofuel increase | 46.81  
138 2030.00 | Active efficiency | Active renovation | Biofuel increase | 44.02  
139 2040.00 | Active efficiency | Active renovation | Biofuel increase | 42.38  
140 2050.00 | Active efficiency | Active renovation | Biofuel increase | 41.77  
141 1920.00 | BAU | Effective renovation | Biofuel increase | 139.77  
142 1930.00 | BAU | Effective renovation | Biofuel increase | 179.32  
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153 2040.00 | BAU | Effective renovation | Biofuel increase | 34.61  
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155 1920.00 | Active efficiency | Effective renovation | Biofuel increase | 139.77  
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159 1960.00 | Active efficiency | Effective renovation | Biofuel increase | 357.78  
160 1970.00 | Active efficiency | Effective renovation | Biofuel increase | 321.03  
161 1980.00 | Active efficiency | Effective renovation | Biofuel increase | 134.56  
162 1990.00 | Active efficiency | Effective renovation | Biofuel increase | 76.35  
163 2000.00 | Active efficiency | Effective renovation | Biofuel increase | 50.07  
164 2010.00 | Active efficiency | Effective renovation | Biofuel increase | 51.08  
165 2020.00 | Active efficiency | Effective renovation | Biofuel increase | 44.35  
166 2030.00 | Active efficiency | Effective renovation | Biofuel increase | 38.69  
167 2040.00 | Active efficiency | Effective renovation | Biofuel increase | 34.26  
168 2050.00 | Active efficiency | Effective renovation | Biofuel increase | 31.22

```r
> ggplot(subset(dal, FuelPolicy == "BAU"), aes(x = Time, weight = DALYsResult, fill = Heating))+geom_bar(binwidth = 5) +
+ facet_grid(EfficiencyPolicy ~ RenovationPolicy) +
+ theme_gray(base_size = BS) +
+ labs(title = "Health effects in DALYs of PM2.5 from heating in Kuopio",
+ x = "Time",
+ y = "Health effects (DALY/a)")
+
> ggplot(subset(dal, Time == 2030), aes(x = RenovationPolicy, weight = DALYsResult, fill = Heating))+geom_bar() +
+ facet_grid(EfficiencyPolicy ~ FuelPolicy) +
+ theme_gray(base_size = BS) +
+ labs(

> title = "Health effects in DALYs of PM2.5 from heating in Kuopio 2030",
> x = "Biofuel policy in district heating",
> y = "Health effects (DALY /a)"
> }
>
> ### Buildings in Kuopio on map
> if(FALSE){
>  + # Calculate locations for Kuopio districts
>  + temp <- buildings
>  + temp@output <- subset(temp@output,
>  + Time == 2030 & EfficiencyPolicy == "BAU" & RenovationPolicy == "BAU"
>  + )
>  + temp <- unkeep(temp, sources = TRUE, prevresults = TRUE)
>  + temp <- oapply(temp, cols = c("Building", "Heating", "Efficiency", "Renovation"), FUN = sum)
>  +
>  + districts <- tidy(opbase.data("Op_en5932.kuopio_city_districts"), widecol = "Location") [[Building stock in Kuopio]]
>  +
>  + colnames(districts) <- gsub("[ ]\.|", "_", colnames(districts))
>  + districts <- Ovariable("districts", data = data.frame(districts, Result = 1))
>  +
>  + temp <- temp * districts
>  +
>  + MyRmap(
>  + ova2spat(
>  + coord = c("E", "N"),
>  + proj4string = "+init=epsg:3067"
>  + ), # National Land Survey uses EPSG:3067 (ETRS-TM35FIN)
>  + plotvar = "Result",
>  + legend_title = "Floor area",
>  + numbins = 8,
>  + pch = 19,
>  + cex = 2
>  + )
>  +
> } if(saveobjects) {
>  + objects.put(list = ls())
>  + cat(c("All objects archived. Write down the key of the run to retrieve them with objects.get. Objects: ",
>  + ls(), ","))
>  +
> All objects archived. Write down the key of the run to retrieve them with objects.get. Objects: ana2ova bgexposure BS bui buildings buildingTypes BW changeBuildings collapseMargin construction constructionAreas dal DALYs DecefficiencyShares DecfuelShares decisions DecrenovationRate DecrenovationShares disincidence dose dummy DW efficiencyRatio efficiencyShares emis emissionFactors emissionLocations emissions energyFactor energyUse ERF ERF_diox ERF_env ERF_mehg ERF_omega3 exposure figstofile findrest finnish forgetDecisions frexposed fuelShares fuelSharesgeneric fuelUse heatingShares if L makeTimeline MyPlotKML MyPointKML MyRmap obstime ograph orbind2 ova2spat population renovationRate renovationShares RR saveobjects server stockBuildings suomenna testforrow threshold threshold_diox threshold_env threshold_mehg threshold_omega3 timepoints timing totcases truncateIndex wiki_username year
Building stock in Kuopio by efficiency policy

<table>
<thead>
<tr>
<th>Floor area (M m²)</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>2050</td>
<td></td>
</tr>
<tr>
<td>2050</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>1950</td>
<td></td>
</tr>
</tbody>
</table>

Efficiency
- Traditional
- Old
- New
- Low-energy
- Passive
Emissions from heating in Kuopio

Fuel
- Electricity
- Heavy oil
- Light oil
- Other
- Peat
- Wood

CO₂direct

CO₂official

PM2.5

Emissions (ton/yr)

Time

1950 2000 2050

1950 2000 2050

3e+05
2e+05
1e+05
0e+00
