

Package: FlowRegEnvCost (via r-universe)

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Type Package

Title The Environmental Costs of Flow Regulation

Version 0.1.2

Description An application to calculate the daily environmental costs of river flow regulation by dams based on García de Jalón et al. (2017) <[doi:10.1007/s11269-017-1663-0](https://doi.org/10.1007/s11269-017-1663-0)>.

Depends R (>= 2.10)

URL <https://github.com/garciadejalon/FlowRegEnvCost>

BugReports <https://github.com/garciadejalon/FlowRegEnvCost/issues>

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adm_range	<i>Calculates the admissible range of flow variability</i>
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Description

Calculates the admissible range of flow variability

Usage

adm_range(First_year, Last_year, Year_impact)

Arguments

First_year	First year to consider in the analysis starting on October 1st (e.g.: First_year = 1964)
Last_year	First year to consider in the analysis finishing on September 30th (e.g.: Last_year = 2011)
Year_impact	Year when the human impact started (the construction of a dam) (e.g.: Year_impact = 1988)

Value

Calculates the admissible range of flow variability based on the flow data during the pre-impact period.

Examples

```
data(flowdata)
adm_range(First_year=1964, Last_year=2011, Year_impact=1988)
```

adm_range_plot	<i>Plots the admissible range of flow variability</i>
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Description

Plots the admissible range of flow variability

Usage

```
adm_range_plot(River_name, First_year, Last_year, Year_impact)
```

Arguments

River_name	Name of the river as character (e.g.: River_name = "Esla")
First_year	First year to consider in the analysis starting on October 1st (e.g.: First_year = 1964)
Last_year	First year to consider in the analysis finishing on September 30th (e.g.: Last_year = 2011)
Year_impact	Year when the human impact started (the construction of a dam) (e.g.: Year_impact = 1988)

Value

Plots the admissible range of flow variability based on the flow data during the pre-impact period.

Examples

```
data(flowdata)
adm_range_plot(River_name = "Esla", First_year=1964, Last_year=2011, Year_impact=1988)
```

daily_cost	<i>Calculates the daily environmental costs of flow regulation</i>
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Description

Calculates the daily environmental costs of flow regulation

Usage

```
daily_cost(First_year, Last_year, Year_evaluated, Year_impact, a_low, a_high,
           b_low, b_high)
```

Arguments

First_year	First year to consider in the analysis starting on October 1st (e.g.: First_year = 1964)
Last_year	First year to consider in the analysis finishing on September 30th (e.g.: Last_year = 2011)
Year_evaluated	Year when the environmental impact is evaluated (e.g.: Year_evaluated = 2010)
Year_impact	Year when the human impact started (the construction of a dam) (e.g.: Year_impact = 1988)
a_low	Coefficient a of Low-flow impact of function ku (e.g.: a_low = 0.05)
a_high	Coefficient a of High-flow impact of function ku (e.g.: a_high = 0.01)
b_low	Coefficient b of Low-flow impact of function ku (e.g.: b_low = 2)
b_high	Coefficient b of High-flow impact of function ku (e.g.: b_high = 2)

Value

Calculates the daily environmental costs of flow regulation for a specific year evaluated.

Examples

```
data(flowdata)
daily_cost(First_year=1964, Last_year=2011, Year_evaluated=2010,
Year_impact=1988, a_low = 0.05, a_high = 0.01, b_low = 2, b_high = 2)
```

daily_cost_plot	<i>Plots the daily environmental costs of flow regulation</i>
-----------------	---

Description

Plots the daily environmental costs of flow regulation

Usage

```
daily_cost_plot(River_name, First_year, Last_year, Year_evaluated, Year_impact,
a_low, a_high, b_low, b_high)
```

Arguments

River_name	Name of the river written as character (e.g.: River_name = "Esla")
First_year	First year to consider in the analysis starting on October 1st (e.g.: First_year = 1964)
Last_year	First year to consider in the analysis finishing on September 30th (e.g.: Last_year = 2011)
Year_evaluated	Year when the environmental impact is evaluated (e.g.: Year_evaluated = 2010)

Year_impact	Year when the human impact started (the construction of a dam) (e.g.: Year_impact = 1988)
a_low	Coefficient a of Low-flow impact of function ku (e.g.: a_low = 0.05)
a_high	Coefficient a of High-flow impact of function ku (e.g.: a_high = 0.01)
b_low	Coefficient b of Low-flow impact of function ku (e.g.: b_low = 2)
b_high	Coefficient b of High-flow impact of function ku (e.g.: b_high = 2)

Value

Plots the daily environmental costs of flow regulation for a specific year evaluated.

Examples

```
data(flowdata)
daily_cost_plot(River_name = "Esla", First_year=1964, Last_year=2011,
Year_evaluated=2010, Year_impact=1988, a_low = 0.05, a_high = 0.01,
b_low = 2, b_high = 2)
```

flowdata	<i>River water flow data</i>
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Description

A dataset containing daily river water flow data for the Esla river at the Riaño dam (Northern Spain) from 01/10/1964 to 30/09/2011. The library adds missing days within the whole period automatically with NA flow values when you enter your own time series data.

Usage

```
flowdata
```

Format

An example data frame with 17166 rows and 2 variables:

Date Date (dd/mm/yyyy)

Flow Water flow, in m^3/s

Source

García de Jalón et al. (2017) [doi:10.1007/s1126901716630](https://doi.org/10.1007/s1126901716630)

impact_reg	<i>Calculates the daily environmental impact of flow regulation (high- and low-flow impact)</i>
------------	---

Description

Calculates the daily environmental impact of flow regulation (high- and low-flow impact)

Usage

```
impact_reg(First_year, Last_year, Year_evaluated, Year_impact)
```

Arguments

First_year	First year to consider in the analysis starting on October 1st (e.g.: First_year = 1964)
Last_year	First year to consider in the analysis finishing on September 30th (e.g.: Last_year = 2011)
Year_evaluated	Year when the environmental impact is evaluated (e.g.: Year_evaluated = 2010)
Year_impact	Year when the human impact started (the construction of a dam) (e.g.: Year_impact = 1988)

Value

Calculates the daily environmental impact of flow regulation (high- and low-flow impact).

Examples

```
data(flowdata)
impact_reg(First_year=1964, Last_year=2011, Year_evaluated=2010, Year_impact=1988)
```

impact_reg_multi_plot	<i>Plots the daily environmental impact of flow regulation for multiple years</i>
-----------------------	---

Description

Plots the daily environmental impact of flow regulation for multiple years

Usage

```
impact_reg_multi_plot(Row, Column, sp_years, River_name, First_year, Last_year,
  Year_impact)
```

Arguments

Row	Number of rows in the figure to compare multiple years in separated graphs (e.g.: Row = 2)
Column	Number of columns in the figure to compare multiple years in separated graphs (e.g.: Column = 5)
sp_years	A vector specifying the years to be plotted (e.g.: sp_years = c(1965,1966,1967,1968,1969,2006,2007,2008))
River_name	Name of the river written as character (e.g.: River_name = "Esla")
First_year	First year to consider in the analysis starting on October 1st (e.g.: First_year = 1964)
Last_year	First year to consider in the analysis finishing on September 30th (e.g.: Last_year = 2011)
Year_impact	Year when the human impact started (the construction of a dam) (e.g.: Year_impact = 1988)

Value

Plots the daily environmental impact of flow regulation for multiple years.

Examples

```
data(flowdata)
impact_reg_multi_plot(Row = 1, Column = 2,
  sp_years = c(1965,2010),
  River_name = "Esla", First_year=1964, Last_year=2011,
  Year_impact=1988)
```

impact_reg_plot	<i>Plots the daily environmental impact of flow regulation (high- and low-flow impact)</i>
-----------------	--

Description

Plots the daily environmental impact of flow regulation (high- and low-flow impact)

Usage

```
impact_reg_plot(River_name, First_year, Last_year, Year_evaluated, Year_impact)
```

Arguments

River_name	Name of the river written as character (e.g.: River_name = "Esla")
First_year	First year to consider in the analysis starting on October 1st (e.g.: First_year = 1964)
Last_year	First year to consider in the analysis finishing on September 30th (e.g.: Last_year = 2011)

Year_evaluated Year when the environmental impact is evaluated (e.g.: Year_evaluated = 2010)
Year_impact Year when the human impact started (the construction of a dam) (e.g.: Year_impact = 1988)

Value

Plots the daily environmental impact of flow regulation (high- and low-flow impact).

Examples

```
data(flowdata)
impact_reg_plot(River_name = "Esla", First_year=1964,
Last_year=2011, Year_evaluated=2010, Year_impact=1988)
```

summary_flow	<i>Provides a summary of flow data during the pre-impact period</i>
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Description

Provides a summary of flow data during the pre-impact period

Usage

```
summary_flow(First_year, Last_year, Year_impact)
```

Arguments

First_year First year to consider in the analysis starting on October 1st (e.g.: First_year = 1964)
Last_year First year to consider in the analysis finishing on September 30th (e.g.: Last_year = 2011)
Year_impact Year when the human impact started (the construction of a dam) (e.g.: Year_impact = 1988)

Value

Provides a dataframe on a daily basis of mean, min, p10, p25, median, p75, p90 and max values during the pre-impact period.

Examples

```
data(flowdata)
summary_flow(First_year=1964, Last_year=2011, Year_impact=1988)
```

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