

# THE USEFULNESS OF WATER FOOTPRINTING FOR WATER MANAGEMENT AND PLANNING: THE GUADIANA BASIN CASE STUDY

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- Spanish Management Planning Instruction, requires a water footprint analysis on Basin Management Plans
- Two water footprint studies in the Guadiana river basin District:
  - “Water footprint analysis for the Guadiana river basin”. Papeles de Agua Virtual. Number 3. Fundación Marcelino Botín. August 2008. (NeWater Project).
  - “Estimation of current and future integrated water demands in Spain” November 2009, Ministry for Environment, Rural and Marine Affairs (MARM),

# “Water footprint analysis for the Guadiana river basin”.

| POPULATION             | SECTORS     | GREEN WATER (Mm <sup>3</sup> /year) | BLUE WATER (Mm <sup>3</sup> /year) | TOTAL | PER CAPITA (m <sup>3</sup> /person/year) | GAV (M€) | PRODUCTIVITY (€/m <sup>3</sup> ) |
|------------------------|-------------|-------------------------------------|------------------------------------|-------|--|----------|----------------------------------|
| <b>TOTAL GUADIANA</b>  |             |                                     |                                    |       |  |          |                                  |
| 1.417.810              | Agriculture | 2.212                               | 1.827                              | 4.039 | 2.849                                    | 1.096    | 0,6                              |
|                        | Cattle      |                                     | 22                                 | 22    | 16                                       | 286      | 12,74                            |
|                        | Urban       |                                     | 130                                | 130   | 91                                       | 128      | 0,99                             |
|                        | Industrial  |                                     | 20                                 | 20    | 14                                       | 1.557    | 77,9                             |
|                        | Total       | 2.212                               | 1.999                              | 4.211 | 2.970                                    | 3.068    | 1,53                             |
| <b>UPPER GUADIANA</b>  |             |                                     |                                    |       |  |          |                                  |
| 636.721                | Agriculture | 1,286                               | 928                                | 2,214 | 3,478                                    | 599      | 0.65                             |
|                        | Cattle      |                                     | 5                                  | 5     | 8  | 131      | 25.05                            |
|                        | Urban       |                                     | 55                                 | 55    | 86                                       | 548      | 0.999                            |
|                        | Industrial  |                                     | 12                                 | 12    | 19                                       | 929      | 77.04                            |
|                        | Total       | 1,286                               | 1                                  | 2,286 | 3,591                                    | 1,714    | 1.71                             |
| <b>MEDIUM GUADIANA</b> |             |                                     |                                    |       |  |          |                                  |
| 672.534                | Agriculture | 905                                 | 886                                | 1,792 | 2,664                                    | 413      | 0.47                             |
|                        | Cattle      |                                     | 13                                 | 13    | 20                                       | 124      | 9.30                             |
|                        | Urban       |                                     | 65                                 | 65    | 96                                       | 648      | 0.999                            |
|                        | Industrial  |                                     | 6                                  | 6     | 9  | 485      | 78.82                            |
|                        | Total       | 905                                 | 970                                | 1,876 | 2,789                                    | 1,086    | 1.12                             |
| <b>LOWER GUADIANA</b>  |             |                                     |                                    |       |  |          |                                  |
| 62.213                 | Agriculture | 21                                  | 13                                 | 33    | 535                                      | 45       | 3.54                             |
|                        | Cattle      |                                     | 1                                  | 1     | 20                                       | 9        | 7.42                             |
|                        | Urban       |                                     | 7                                  | 7     | 106                                      | 78       | 0.999                            |
|                        | Industrial  |                                     | 1                                  | 1     | 16                                       | 82       | 80.76                            |
|                        | Total       | 21                                  | 22                                 | 42    | 677                                      | 143      | 6.63                             |

**Water footprint in relation to production in Guadiana river basin**

Source: Aldaya, Maite M. y Llamas, M.R. “Water footprint analysis for the Guadiana river basin”.Papeles de Agua Virtual. Número 3. Fundación Marcelino Botín. Agosto 2008.

Data are linked to economic variable indexes like Gross added Value (GAV) (or e.g. employment).

# “Estimation of current and future integrated water demands in Spain”

| Nº                             | RESULTADOS  | HH Estándar Verde (hm³)       | HH Estándar Azul (hm³) | HH Estándar Total (hm³) | HH Adaptada Verde (hm³)       | HH Adaptada Azul (hm³) | HH Adaptada Total (hm³) |
|--------------------------------|---|-------------------------------|------------------------|-------------------------|-------------------------------|------------------------|-------------------------|
| 1                              | Agricultura   | 457,1                         | 602,0                  | <b>1.059,1</b>          | 1.896,7                       | 2.458,4                | <b>4.355,1</b>          |
| 2                              | Ganadería y caza  | 188,5                         | 16,3                   | <b>204,8</b>            | 2.568,9                       | 25,2                   | <b>2.594,1</b>          |
| 3                              | Selvicultura y explotación forestal                               | 423,6                         | 0,4                    | <b>424,0</b>            | 1.068,6                       | 0,0                    | <b>1.068,6</b>          |
| 4                              | Pesca   | 0,9                           | 1,4                    | <b>2,2</b>              | 0,0                           | 0,5                    | <b>0,5</b>              |
| 5                              | Industrias extractivas  | 6,7                           | 6,1                    | <b>12,8</b>             | 0,0                           | 0,2                    | <b>0,2</b>              |
| 6                              | Industria de la alimentación cárnica y láctea                     | 421,9                         | 109,8                  | <b>531,8</b>            | 0,0                           | 0,7                    | <b>0,7</b>              |
| 7                              | Resto Industria de la alimentación, bebidas y tabaco              | 284,9                         | 299,1                  | <b>584,0</b>            | 0,0                           | 1,8                    | <b>1,8</b>              |
| 8                              | Industria textil, de la confección, del cuero y del calzado       | 17,7                          | 22,0                   | <b>39,7</b>             | 0,0                           | 0,1                    | <b>0,1</b>              |
| 9                              | Industria de la madera y del corcho                               | 56,7                          | 0,7                    | <b>57,3</b>             | 0,0                           | 0,4                    | <b>0,4</b>              |
| 10                             | Industria del papel; edición, artes gráficas y reproducción       | 28,3                          | 1,3                    | <b>29,5</b>             | 0,0                           | 0,1                    | <b>0,1</b>              |
| 11                             | Refino de petróleo y tratamiento de combustibles nucleares        | 0,4                           | 1,2                    | <b>1,6</b>              | 0,0                           | 0,0                    | <b>0,0</b>              |
| 12                             | Industria química   | 65,7                          | 24,4                   | <b>90,2</b>             | 0,0                           | 2,0                    | <b>2,0</b>              |
| 13                             | Industria del caucho y materias plásticas                         | 18,8                          | 5,8                    | <b>24,7</b>             | 0,0                           | 1,3                    | <b>1,3</b>              |
| 14                             | Industrias de otros productos minerales no metálicos              | 1,6                           | 1,0                    | <b>2,6</b>              | 0,0                           | 0,9                    | <b>0,9</b>              |
| 15                             | Metalurgia y fabricación de productos metálicos                   | 2,7                           | 3,9                    | <b>6,6</b>              | 0,0                           | 0,2                    | <b>0,2</b>              |
| 16                             | Industria de la construcción de maquinaria, electrónico y óptico. | 3,4                           | 3,3                    | <b>6,7</b>              | 0,0                           | 0,2                    | <b>0,2</b>              |
| 17                             | Fabricación de material de transporte                             | 4,6                           | 3,8                    | <b>8,4</b>              | 0,0                           | 0,1                    | <b>0,1</b>              |
| 18                             | Industrias manufactureras diversas                                | 13,3                          | 0,7                    | <b>14,0</b>             | 0,0                           | 0,0                    | <b>0,0</b>              |
| 19                             | Captación, depuración y distribución de agua                      | 0,1                           | 17,8                   | <b>17,9</b>             | 0,0                           | 19,1                   | <b>19,1</b>             |
| 20                             | Producción y distribución de energía y gas                        | 0,2                           | 2,1                    | <b>2,3</b>              | 0,0                           | 10,2                   | <b>10,2</b>             |
| 21                             | Construcción  | 18,1                          | 7,1                    | <b>25,2</b>             | 0,0                           | 0,9                    | <b>0,9</b>              |
| 22                             | Actividades de tratamiento de aguas residuales y alcantarillado   | 0,1                           | 1,1                    | <b>1,2</b>              | 0,0                           | 1,1                    | <b>1,1</b>              |
| 23                             | Hoteles (Turismo)   | 3,6                           | 3,6                    | <b>7,1</b>              | 0,0                           | 0,7                    | <b>0,7</b>              |
| 24                             | Restaurantes  | 35,9                          | 40,2                   | <b>76,1</b>             | 0,0                           | 7,9                    | <b>7,9</b>              |
| 25                             | Otras actividades económicas (Servicios)                          | 31,9                          | 29,7                   | <b>61,6</b>             | 0,0                           | 9,4                    | <b>9,4</b>              |
| <b>TOTAL</b>                   |   | <b>2.086,7</b>                | <b>1.204,5</b>         | <b>3.291,2</b>          | <b>5.534,2</b>                | <b>2.541,4</b>         | <b>8.075,7</b>          |
| Consumo Humano                 |   | 0,0                           | 91,0                   | 91,0                    | 0,0                           | 91,0                   | 91,0                    |
| Unidades: (hm³/año)            |   | <b>HH Estándar Total</b>      |                        | <b>3.382,2</b>          | <b>HH Adaptada Total</b>      |                        | <b>8.166,7</b>          |
| Unidades: (m³/habitante y año) |   | <b>HH Estándar per cápita</b> |                        | <b>2.373,5</b>          | <b>HH Adaptada per cápita</b> |                        | <b>5.730,9</b>          |

Components of standard and adapted water footprint by sectors in the Guadiana river District. Units (Mm³), Base year 2005.

## “Estimation of current and future integrated water demands in Spain”

| Recursos Disponibles | HH Estándar Azul | BALANCE CONSUMO | HH Adaptada Azul | BALANCE DEMANDA |
|----------------------|------------------|-----------------|------------------|-----------------|
| 4.035,5              | 1.295,5          | 2.740,0         | 2.537,9          | 1.497,6         |

*Balance between potentially available resources and water footprint in the Guadiana River Basin. Units (Mm<sup>3</sup>), Base year 2005.*

| DEMARCACIÓN                  | Recursos Disponibles | HH Estándar Azul | BALANCE CONSUMO | HH Adaptada Azul | BALANCE DEMANDA |
|------------------------------|----------------------|------------------|-----------------|------------------|-----------------|
| JUCAR                        | 3.337,5              | 5.908,7          | -2.571,2        | 2.664,2          | 673,3           |
| ISLAS BALEARES               | 731,7                | 618,9            | 112,8           | 176,1            | 555,6           |
| LANZAROTE                    | 33,0                 | 154,1            | -121,1          | 15,0             | 18,0            |
| EBRO                         | 14.211,1             | 3.544,6          | 10.666,5        | 6.871,0          | 7.340,1         |
| TAJO                         | 5.810,1              | 10.667,8         | -4.857,7        | 2.174,8          | 3.635,3         |
| TENERIFE                     | 275,2                | 1.050,3          | -775,1          | 146,3            | 129,0           |
| GRAN CANARIA                 | 277,2                | 1.004,5          | -727,3          | 109,3            | 167,9           |
| MIÑO-SIL                     | 11.744,6             | 297,4            | 11.447,2        | 163,4            | 11.581,2        |
| GALICIA-COSTA                | 11.107,3             | 527,3            | 10.580,0        | 212,2            | 10.895,1        |
| GUADALQUIVIR                 | 8.002,8              | 4.263,4          | 3.739,3         | 4.433,6          | 3.569,2         |
| CANTABRICO                   | 14.375,4             | 1.011,3          | 13.364,1        | 501,3            | 13.874,1        |
| DUERO                        | 7.678,6              | 1.663,2          | 6.015,4         | 2.804,0          | 4.874,6         |
| FUERTEVENTURA                | 59,5                 | 108,5            | -48,9           | 8,6              | 51,0            |
| CUENCAS INTERNAS PAIS VASCO  | 1.672,1              | 779,0            | 893,1           | 174,0            | 1.498,1         |
| ISLA DE HIERRO               | 30,8                 | 13,1             | 17,7            | 1,7              | 29,1            |
| CUENCAS INTERNAS DE CATALUÑA | 3.022,1              | 8.951,4          | -5.929,3        | 1.157,4          | 1.864,7         |
| SEGURA                       | 1.324,9              | 2.812,7          | -1.487,8        | 1.484,1          | -159,2          |
| GUADIANA                     | 4.035,5              | 1.295,5          | 2.740,0         | 2.537,9          | 1.497,6         |
| GUADALETE Y BARBATE          | 1.438,5              | 842,2            | 596,3           | 427,9            | 1.010,6         |
| ISLA DE LA GOMERA            | 45,1                 | 27,2             | 17,8            | 6,0              | 39,1            |
| ISLA DE LA PALMA             | 238,6                | 106,7            | 131,8           | 29,5             | 209,1           |
| CUENCA MEDITERRANEA ANDALUZA | 2.717,0              | 2.447,9          | 269,1           | 985,9            | 1.731,1         |
| TINTO, ODIEL Y PIEDRAS       | 869,8                | 355,7            | 514,1           | 218,0            | 651,8           |
| <b>TOTAL</b>                 | <b>93.038,3</b>      | <b>48.451,4</b>  | <b>44.586,9</b> | <b>27.302,0</b>  | <b>65.736,3</b> |

*Balance between potentially available resources and water footprint in Spanish River Basins  
Units (Mm<sup>3</sup>), Base year 2005*

A new concept is included: Adapted water footprint (related to direct water consumption) and balances between water footprint and potentially available resources.

- 1.- Different definitions for similar concepts.
- 2.- Problems with data availability.
- 3.- Methodology problems.
- 4.- Water footprint linked with other data
  - a) Socio-economic indexes.
  - b) Hydrological indexes.
  - c) Environmental status.

| DEMARCACIÓN                  | Recursos Disponibles | HH Estándar Azul | BALANCE CONSUMO | HH Adaptada Azul | BALANCE DEMANDA |
|------------------------------|----------------------|------------------|-----------------|------------------|-----------------|
| JUCAR                        | 3.337,5              | 5.908,7          | -2.571,2        | 2.664,2          | 673,3           |
| ISLAS BALEARES               | 731,7                | 618,9            | 112,8           | 176,1            | 555,6           |
| LANZAROTE                    | 33,0                 | 154,1            | -121,1          | 15,0             | 18,0            |
| EBRO                         | 14.211,1             | 3.544,6          | 10.666,5        | 6.871,0          | 7.340,1         |
| TAJO                         | 5.810,1              | 10.667,8         | -4.857,7        | 2.174,8          | 3.635,3         |
| TENERIFE                     | 275,2                | 1.050,3          | -775,1          | 146,3            | 129,0           |
| GRAN CANARIA                 | 277,2                | 1.004,5          | -727,3          | 109,3            | 167,9           |
| MIÑO-SIL                     | 11.744,6             | 297,4            | 11.447,2        | 163,4            | 11.581,2        |
| GALICIA-COSTA                | 11.107,3             | 527,3            | 10.580,0        | 212,2            | 10.895,1        |
| GUADALQUIVIR                 | 8.002,8              | 4.263,4          | 3.739,3         | 4.433,6          | 3.569,2         |
| CANTABRICO                   | 14.375,4             | 1.011,3          | 13.364,1        | 501,3            | 13.874,1        |
| DUERO                        | 7.678,6              | 1.663,2          | 6.015,4         | 2.804,0          | 4.874,6         |
| FUERTEVENTURA                | 59,5                 | 108,5            | -48,9           | 8,6              | 51,0            |
| CUENCAS INTERNAS PAIS VASCO  | 1.672,1              | 77,0             | 893,1           | 174,0            | 1.498,1         |
| ISLA DE HIERRO               | 30,8                 | 13,1             | 17,7            | 1,7              | 29,1            |
| CUENCAS INTERNAS DE CATALUÑA | 3.022,1              | 8.951,4          | -5.929,3        | 1.157,4          | 1.864,7         |
| SEGURA                       | 1.324,9              | 2.812,7          | -1.487,8        | 1.484,1          | -159,2          |
| GUADIANA                     | 4.035,5              | 1.295,5          | 2.740,0         | 2.537,9          | 1.497,6         |
| GUADALETE Y BARBATE          | 1.438,5              | 842,2            | 596,3           | 427,9            | 1.010,6         |
| ISLA DE LA GOMERA            | 45,1                 | 27,2             | 17,8            | 6,0              | 39,1            |
| ISLA DE LA PALMA             | 238,6                | 106,7            | 131,8           | 29,5             | 209,1           |
| CUENCA MEDITERRANEA ANDALUZA | 2.717,0              | 2.447,9          | 269,1           | 985,9            | 1.731,1         |
| TINTO, ODIEL Y PIEDRAS       | 869,8                | 355,7            | 514,1           | 218,0            | 651,8           |
| <b>TOTAL</b>                 | <b>93.038,3</b>      | <b>48.451,4</b>  | <b>44.586,9</b> | <b>27.302,0</b>  | <b>65.736,3</b> |

*Balance between potentially available resources and water footprint in Spanish River Basins  
Units (Mm<sup>3</sup>), Base year 2005*

- 1.- Different definitions for similar concepts.
- 2.- Problems with data availability.
- 3.- Methodology problems.
- 4.- Water footprint linked with other data
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## Speech of Dr. José Torán in the Centre of Hydrological Studies CEDEX, January 1972

3. (...) We have to understand it is not possible to continue in this way (...) which requires 50 m<sup>3</sup> of water per year for a man maintenance and 10.000 m<sup>3</sup> for his feeding.
4. (...) When drinking water becomes rare and precious, on the threshold of the Battle of Water, it seems the moment of thinking about if it is better sacrifice what two hundred men need, for a landscape, prophylaxis, riparian environment and urgent needing of drinking (...). Water (..) one eats others will not be able to drink and enjoy (...)
7. We conclude with the egg of Colon, in this case the egg of the Hilton (Hotel) (...) A guest in a Grand "Palace"(hotel) requires 3.000 litres, but the boiled egg for his breakfast means 4.000 litres. Can we afford this way of use of water (...) from irrigated maize continues to a hen-factory till proteins of an egg at a price of 4.000 litres of water per unit are got, which is equivalent to 20 urban men needs, without satisfying previously the direct water supply of the rest?.