# SUPPLEMENTARY MATERIALS

# Supplementary Materials I – Water quality classes, Cost factors and weighting profile

Table 1: Typical wastewater qualities and guidelines for wastewater reuse (‘-‘stand for ’no data available‘ or ’not defined’)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Water quality classes** | **Turbidity [Nephelometric Turbidity Unit, NTU]** | **Total Suspended Solids (TSS) [mg/L]** | **Biological Oxygen Demand (BOD) [mg/L]** | **Chemical Oxygen Demand (COD) [mg/L]** | **Fecal Coliforms (FC) [CFU/100ml]** | **Total Coliforms (TC) [CFU/100ml]** |
| *Typical wastewater quality in the Mediterranean and African Countries (MAC)* (Asano et al. 2007b; Oertlé and Gauer 2018; Frascari 2019) | | | | | | |
| Municipal wastewater quality | 100 | 400 | 400 | 1,000 | 10,000 | 5,600,000 |
| Municipal wastewater treatment plant secondary effluent | 0.5 | 25 | 31 | 56 | - | 10,000 |
| Olive mill wastewater | - | 12,000 | 40,000 | 60,000 | 1 | 1 |
| Fruit and vegetable packaging wastewater | - | 250 | 350 | 700 | 8,000,000 | 30,000,000 |
| Drainage canal water | - | 80 | 40 | 72 | 178,000 | - |
| Textile wastewater | 334 | 104 | 69 | 356 | - | - |
| *BS ISO 16075-2:2015 Guidelines for treated wastewater use for irrigation projects (ISO 16075-2 2015)* | | | | | | |
| Cat. A: Unrestricted urban irrigation and agricultural irrigation of food crops consumed raw | 5 | 10 | 10 | - | - | 100 |
| Cat. B: Restricted urban irrigation and agricultural irrigation of processed food crops | - | 25 | 20 | - | - | 1,000 |
| Cat. C: Agricultural irrigation of non-food crops | - | 50 | 35 | - | - | 10,000 |
| Cat. D: Restricted irrigation of industrial and seeded crops | - | 140 | 100 | - | - | - |
| Cat. E: Restricted irrigation of industrial and seeded crops | - | - | 35 | - | - | - |
| *Egyptian Guidelines for wastewater reuse* (El Bouraie u. a. 2011; Elbana u. a. 2014) | | | | | | |
| Level A: Landscape irrigation in urban areas | - | 20 | 20 | - | - | 1,000 |
| Level B: Agriculture purposes in desert areas | - | 50 | 60 | - | - | 5,000 |
| Level C: Agriculture purposes in desert areas | - | 250 | 400 | - | - | - |
| Law 48/1982: Protection of the River Nile and water ways | - | - | 6 | 10 | - | - |
| *Moroccan water irrigation regulation* (S.E.E.E. 2007) | | | | | | |
| Cat A: Irrigation of crops to be eaten raw | - | 100 | - | - | 1,000 | - |
| Cat B & C: Irrigation of other crops | - | 100 | - | - | - | - |
| *Tunisian guidelines for wastewater reuse* (WHO 2006; Food and Agricultural Organisation of the United Nations 2013) | | | | | | |
| NT 106.03 standard: Irrigation | - | 30 | 30 | 90 | - | - |
| Norm 106.03 revised, Cat I: Agriculture use | - | - | - | - | - | - |
| Norm 106.03 revised, Cat II: Golf places, urban parcs, green zones | - | - | - | - | 1,000 | - |
| Norm 106.03 revised, Cat III: Infiltration of groundwater for agricultural use | 5 | - | 20 | 125 | 1,000 | - |

Table 2: Cost factors considered for Egypt, Morocco, and Tunisia. ‘-‘stand for ’no data available‘ or ’not defined.

| **Country** | **Parameters** | **Unit** | **Default value** | **Reference** | **Comment** |
| --- | --- | --- | --- | --- | --- |
| Egypt | Currency | [EGP] | Egyptian Pound |  | The reference community is based on USD from 2006. |
| Exchange rate to USD 2006 | [EGP / USD] | 5.772 ( Jan 2006) 7.319 | (European Commission 2019)  (Coinnews Media Group LLC 2018) | To define the exchange rate, it is recommended to use the exchange rate from 2006 and to include inflation rate or other evolution factors since 2006 (European Commission). |
| Land cost | [USD/ha] | 10,000 | - | Own estimation was used for the assessment |
| Electricity cost 2018 | [USD/kWh] | 0.02 | (GlobalPetrolPrices.com 2018) | Average electricity cost should be used. |
| Personal cost | [EGP/per month] | 3,121 | (Economic Research Institute 2019) | Median Base Salary for Blue Collar Worker |
| Discount rate (r) 9.7.2017 | [%/a] | 19.25 | (Central Intelligence Agency 2019) | Real interest rate r = nominal interest rate (i) – actual inflation rate (p) |
| Morocco | Currency | [MAD] | Moroccan dirham |  | The reference community is based on USD from 2006. |
| Exchange rate to USD 2006 | [MAD / USD] | 9.246 (Jan 2006) 11.724 | (European Commission 2019)  (Coinnews Media Group LLC 2018) | To define the exchange rate, it is recommended to use the exchange rate from 2006 and to include inflation rate or other evolution factors since 2006 (European Commission). |
| Land cost | [USD/ha] | 10,000 | - | Own estimation was used for the assessment |
| Electricity cost 2018 | [USD/kWh] | 0.11 | (GlobalPetrolPrices.com 2018) | Average electricity cost should be used. |
| Personal cost | [MAD/per month] | 3,957 | (Economic Research Institute 2019) | Median Base Salary for Blue Collar Worker |
| Discount rate (r) 31.12.2010 | [%/a] | 6.5 | (Central Intelligence Agency 2019) | Real interest rate r = nominal interest rate (i) – actual inflation rate (p) |
| Tunisia | Currency | [TND] | Tunisian dinar |  | The reference community is based on USD from 2006. |
| Exchange rate to USD 2006 | [TND / USD] | 1.361 (2006) 1.726 | (European Commission 2019)  (Coinnews Media Group LLC 2018) | To define the exchange rate, it is recommended to use the exchange rate from 2006 and to include inflation rate or other evolution factors since 2006s (European Commission). |
| Land cost | [USD/ha] | 10,000 | - | Own estimation was used for the assessment |
| Electricity cost 2018 | [USD/kWh] | 0.07 | (GlobalPetrolPrices.com 2018) | Average electricity cost should be used. |
| Personal cost | [TND/per month] | 2250-3000 | (Global Logistic Cluster 2014) | Manual Skilled Labour |
| Discount rate (r) 31.12.2010 | [%/a] | 5.75 | (Central Intelligence Agency 2019) | Real interest rate r = nominal interest rate (i) – actual inflation rate (p) |

Table 3: Weighting profile applied with assessment criteria for multi criteria analysis with qualitative or semi-quantitative information. ‘-‘stand for ’no data available‘ or ’not defined.

|  |  |  |  |
| --- | --- | --- | --- |
| **Technical evaluation** | **Weight** | **Requirements and impacts** | **Weight** |
| Reliability | Important | Power demand | Regular |
| Ease to upgrade | - | Chemical demand | - |
| Adaptability to varying flow | - | Odor generation | - |
| Adaptability to varying quality | Important | Impact on ground water | - |
| Ease of O & M | Very Important | Land requirement | - |
| Ease of construction | - | Cost of treatment | Important |
| Ease of demonstration | - | Quantity of sludge production | - |

# Supplementary Materials II – Detailed results for the assessment A

Table 4: Top-ranking options for treating municipal wastewater to comply with ISO guidelines in Egypt, Morocco and Tunisia based on cost (C1-C3) and weights (W1-W3).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Typical municipal wastewater quality (MWW)** | | | | | |  |
| **Ranking** | **Egypt** | **Cost** [USD/m3] | **Morocco** | **Cost** [USD/m3] | **Tunisia** | **Cost** [USD/m3] |
| *Cat. A: Unrestricted urban irrigation and agricultural irrigation of food crops consumed raw* | | | | | | |
| *C1* | Title 22: Belgium | 0.97 | Title 22: Belgium | 0.59 | Title 22: Belgium | 0.52 |
| *C2* | Soil treatment: Israel | 1.15 | Title 22: USA I | 0.66 | Title 22: USA I | 0.61 |
| *C3* | Title 22: USA I | 1.19 | Only disinfection Benchmark | 0.68 | Only disinfection Benchmark | 0.65 |
| *W1* | Only disinfection Benchmark | 1.19 | Only disinfection Benchmark | 0.68 | Only disinfection Benchmark | 0.65 |
| *W2* | Lagooning: South Africa | 1.29 | Lagooning: South Africa | 0.74 | Lagooning: South Africa | 0.70 |
| *W3* | Lagooning: Israel | 1.64 | Lagooning: Israel | 0.93 | Lagooning: Israel | 0.87 |
| *Cat. B: Restricted urban irrigation and agricultural irrigation of processed food crops* | | | | | | |
| *C1* | Wetlands: USA | 0.80 | Wetlands: USA | 0.44 | Wetlands: USA | 0.42 |
| *C2* | Title 22: Belgium | 0.97 | Title 22: Belgium | 0.59 | Title 22: Belgium | 0.52 |
| *C3* | Only disinfection: USA | 1.03 | Only disinfection: USA | 0.61 | Only disinfection: USA | 0.57 |
| *W1* | Only disinfection Benchmark | 1.19 | Only disinfection Benchmark | 0.68 | Only disinfection Benchmark | 0.65 |
| *W2* | Lagooning: South Africa | 1.29 | Lagooning: South Africa | 0.74 | Lagooning: South Africa | 0.70 |
| *W3* | Local MBR: Japan | 1.27 | Local MBR: Japan | 0.73 | Local MBR: Japan | 0.67 |
| *Cat. C: Agricultural irrigation of non-food crops* | | | | | |  |
| *C1* | Wetlands: USA | 0.80 | Wetlands: USA | 0.44 | Wetlands: USA | 0.42 |
| *C2* | Title 22: Belgium | 0.97 | Title 22: Belgium | 0.59 | Title 22: Belgium | 0.52 |
| *C3* | Wetlands: Spain | 1.01 | Wetlands: Spain | 0.59 | Wetlands: Spain | 0.56 |
| *W1* | Wetlands: Spain | 1.01 | Wetlands: Spain | 0.59 | Wetlands: Spain | 0.56 |
| *W2* | Only disinfection Benchmark | 1.19 | Only disinfection Benchmark | 0.68 | Only disinfection Benchmark | 0.65 |
| *W3* | Lagooning: South Africa | 1.29 | Lagooning: South Africa | 0.74 | Lagooning: South Africa | 0.70 |

Table 5: Top-ranking options for treating municipal wastewater secondary effluent to comply with ISO guidelines in Egypt, Morocco and Tunisia based on cost (C1-C3) and weights (W1-W3).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Typical municipal wastewater treatment plant secondary effluent (MWW-Eff)** | | | | | | |
| **Ranking** | **Egypt** | **Cost** [USD/m3] | **Morocco** | **Cost** [USD/m3] | **Tunisia** | **Cost** [USD/m3] |
| *Cat. A: Unrestricted urban irrigation and agricultural irrigation of food crops consumed raw* | | | | | | |
| *C1* | Lagooning: Australia I | 0.39 | Lagooning: Australia I | 0.23 | Lagooning: Australia I | 0.22 |
| *C2* | Title 22: Spain | 0.45 | Lagooning: Australia II | 0.28 | Lagooning: Australia II | 0.26 |
| *C3* | Lagooning: Australia II | 0.47 | Title 22: Spain | 0.29 | Title 22: Spain | 0.26 |
| *W1* | Wetlands: Spain | 1.01 | Wetlands: Spain | 0.59 | Wetlands: Spain | 0.56 |
| *W2* | Only disinfection: Chile | 0.93 | Only disinfection: Chile | 0.55 | Only disinfection: Chile | 0.52 |
| *W3* | Lagooning: Australia I | 0.39 | Lagooning: Australia I | 0.23 | Lagooning: Australia I | 0.22 |
| *Cat. B: Restricted urban irrigation and agricultural irrigation of processed food crops* | | | | | | |
| *C1* | Lagooning: Australia I | 0.39 | Lagooning: Australia I | 0.23 | Lagooning: Australia I | 0.22 |
| *C2* | Direct membrane filtration Benchmark Technology | 0.40 | Direct membrane filtration Benchmark Technology | 0.28 | Lagooning: Australia II | 0.26 |
| *C3* | Title 22: Spain | 0.45 | Lagooning: Australia II | 0.28 | Direct membrane filtration Benchmark Technology | 0.26 |
| *W1* | Wetlands: Spain | 1.01 | Wetlands: Spain | 0.59 | Wetlands: Spain | 0.56 |
| *W2* | Only disinfection: Chile | 0.93 | Only disinfection: Chile | 0.55 | Only disinfection: Chile | 0.52 |
| *W3* | Lagooning Benchmark Technology | 0.58 | Lagooning Benchmark Technology | 0.35 | Lagooning Benchmark Technology | 0.33 |
| *Cat. C: Agricultural irrigation of non-food crops* | | | | | | |
| *C1* | No treatment | 0.00 | No treatment | 0.00 | No treatment | 0.00 |
| *W1* | No treatment | 0.00 | No treatment | 0.00 | No treatment | 0.00 |

Table 6: Top-ranking treatment trains for treating municipal wastewater and secondary effluents to comply with Moroccan regulations based on cost (C1-C3) and weights (W1-W3).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Ranking** | **Moroccan Irrigation Regulation - Cat A: irrigation of crops to be eaten raw** | **Cost** [USD/m3] | **Moroccan Irrigation Regulation - Cat B & C: irrigation of other crops** | **Cost** [USD/m3] |
| *Typical municipal wastewater quality (MWW)* | | | | |
| *C1* | Wetlands: Nicaragua | 0.16 | Wetlands: Nicaragua | 0.16 |
| *C2* | Wetlands: Brazil | 0.17 | Wetlands: Brazil | 0.17 |
| *C3* | Lagooning: Australia I | 0.23 | Lagooning: Australia I | 0.23 |
| *W1* | Wetlands: Spain | 0.59 | Wetlands: Spain | 0.59 |
| *W2* | Only disinfection: Chile | 0.55 | Only disinfection: Chile | 0.55 |
| *W3* | Lagooning Benchmark Technology | 0.35 | Lagooning Benchmark Technology | 0.35 |
| *Typical municipal wastewater treatment plant secondary effluent (MWW-Eff)* | | | | |
| *C1* | No treatment | 0.00 | No treatment | 0.00 |
| *W1* | No treatment | 0.00 | No treatment | 0.00 |

Table 7: Top-ranking treatment trains for treating municipal wastewater and secondary effluents to comply with Egyptian regulations based on cost (C1-C3) and weights (W1-W3).

| **Ranking** | **Egyptian wastewater reuse regulation - Level A: landscape irrigation in urban areas** | **Cost** [USD/m3] | **Egyptian wastewater reuse regulation - Level B: agriculture purposes in desert areas** | **Cost** [USD/m3] |
| --- | --- | --- | --- | --- |
| *Typical municipal wastewater quality (MWW)* | | | | |
| *C1* | Wetlands: USA | 0.80 | Lagooning: Australia I | 0.39 |
| *C2* | Title 22: Belgium | 0.97 | Only disinfection: Brazil | 0.51 |
| *C3* | Only disinfection: USA | 1.03 | Wetlands: USA | 0.80 |
| *W1* | Only disinfection Benchmark Technology | 1.19 | Wetlands: Spain | 1.01 |
| *W2* | Lagooning: South Africa | 1.29 | Lagooning: Australia I | 0.39 |
| *W3* | Local MBR: Japan | 1.27 | Only disinfection: Brazil | 0.51 |
| *Typical municipal wastewater treatment plant secondary effluent (MWW-Eff)* | | | | |
| *C1* | Direct membrane filtration Benchmark Technology | 0.40 | Direct membrane filtration Benchmark Technology | 0.40 |
| *C2* | Title 22: Spain | 0.45 | Title 22: Spain | 0.45 |
| *C3* | Only disinfection: Brazil | 0.51 | Only disinfection: Brazil | 0.51 |
| *W1* | Wetlands: Spain | 1.01 | Wetlands: Spain | 1.01 |
| *W2* | Only disinfection: Chile | 0.93 | Only disinfection: Chile | 0.93 |
| *W3* | Lagooning Benchmark Technology | 0.58 | Lagooning Benchmark Technology | 0.58 |

Table 8: Top-ranking options for treating municipal wastewater and secondary effluents to comply with Tunisian regulations based on cost (C1-C3) and weights (W1-W3).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Ranking** | **Tunisian wastewater reuse regulation - NT 106.03 standard: irrigation** | **Cost** [USD/m3] | **Tunisian wastewater reuse regulation - Norm 106.03 revised, Cat III: infiltration of groundwater for agricultural use** | **Cost** [USD/m3] |
| *Typical municipal wastewater quality (MWW)* | | | | |
| *C1* | Wetlands: Senegal | 0.37 | Only disinfection: Chile | 0.52 |
| *C2* | Wetlands: USA | 0.42 | Title 22: Belgium | 0.52 |
| *C3* | Title 22: Belgium | 0.52 | Wetlands: Spain | 0.56 |
| *W1* | Wetlands: Spain | 0.56 | Wetlands: Spain | 0.56 |
| *W2* | Only disinfection Benchmark Technology | 0.65 | Only disinfection: Chile | 0.52 |
| *W3* | Lagooning: South Africa | 0.70 | Only disinfection Benchmark Technology | 0.65 |
| *Typical municipal wastewater treatment plant secondary effluent (MWW-Eff)* | | | | |
| *C1* | Wetlands: Nicaragua | 0.15 | Wetlands: Nicaragua | 0.15 |
| *C2* | Wetlands: Brazil | 0.16 | Wetlands: Brazil | 0.16 |
| *C3* | Lagooning: Australia I | 0.22 | Wetlands: Peru | 0.22 |
| *W1* | Wetlands: Spain | 0.56 | Wetlands: Spain | 0.56 |
| *W2* | Only disinfection: Chile | 0.52 | Only disinfection: Chile | 0.52 |
| *W3* | Lagooning Benchmark Technology | 0.33 | Lagooning Benchmark Technology | 0.33 |

**Table 9:** Cost factors for selected treatment trains designed for specific types of wastewater in Egypt (EGY), Morocco (MAR), and Tunisia (TUN).

| **Country** | **Capital Costs per year**  [1,000 USD/a] | **Capital Expenditure (CAPEX)**  [1,000 USD] | **Land Cost per year**  [1,000 USD/a] | **Energy cost per year** [1,000 USD/a] | **Labour cost per year**  [1,000 USD/a] | **Other Operation and Maintenance costs per year**  [1,000 USD/a] | **Total costs per year** [1,000 USD/a] | **End Flow per year**  [1,000 m3/year] | **Cost / m3**  [USD/m3] |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Treatment train for drainage canal water (DCW) (average flow: 1,000 [m3/d])* | | | | | | | | | |
| *EGY* | 104 | 537 | 38 | 1 | 0 | 42 | 185 | 365 | 0.51 |
| *MAR* | 47 | 619 | 15 | 4 | 0 | 42 | 109 | 365 | 0.30 |
| *TUN* | 45 | 631 | 14 | 3 | 0 | 42 | 104 | 365 | 0.28 |
| *Treatment train for fruit and vegetable packaging wastewater (FVPWW) (average flow: 200 [m3/d])* | | | | | | | | | |
| *EGY* | 209 | 1,081 | 0 | 1 | 1 | 26 | 237 | 72 | 3.28 |
| *MAR* | 90 | 1,181 | 0 | 8 | 1 | 26 | 125 | 72 | 1.73 |
| *TUN* | 85 | 1,195 | 0 | 5 | 3 | 26 | 118 | 72 | 1.63 |
| *Treatment train for municipal wastewater (MWW) (average flow: 10,000 [m3/d])* | | | | | | | | | |
| *EGY* | 2,811 | 14,527 | 290 | 22 | 2 | 821 | 3,946 | 3,577 | 1.10 |
| *MAR* | 1,176 | 15,355 | 115 | 121 | 1 | 821 | 2,234 | 3,577 | 0.62 |
| *TUN* | 1,094 | 15,469 | 106 | 77 | 5 | 821 | 2,103 | 3,577 | 0.59 |
| *Treatment train for olive mill wastewater (OMWW) (average flow: 100 [m3/d])* | | | | | | | | | |
| *EGY* | 37 | 194 | 0 | 0 | 0 | 3 | 41 | 30 | 1.39 |
| *MAR* | 17 | 219 | 0 | 2 | 0 | 3 | 22 | 30 | 0.75 |
| *TUN* | 16 | 223 | 0 | 1 | 1 | 3 | 22 | 30 | 0.73 |
| *Treatment train for textile wastewater (TWW) (average flow: 200 [m3/d])* | | | | | | | | | |
| *EGY* | 240 | 1,240 | 0 | 1 | 1 | 21 | 263 | 72 | 3.68 |
| *MAR* | 95 | 1,240 | 0 | 4 | 1 | 21 | 121 | 72 | 1.69 |
| *TUN* | 88 | 1,240 | 0 | 3 | 3 | 21 | 115 | 72 | 1.60 |

# Supplementary Materials III – Detailed Material and Methods, and Results for the water reuse implementation potential assessment

Table 10: Detailed description of the thematic subjects, key questions, quantitative and semi-quantitative indicators with possible data sources. N/Av stands for ‘not available’.

| Thematic subject | Key question | Indicator | Description | Unit | References |
| --- | --- | --- | --- | --- | --- |
| Economy | -What is the official financial development assistance (gross expenditure) for water supply and sanitation? | Total official financial development (gross disbursement) assistance for water supply and sanitation for water supply and sanitation by recipient per WW production in a country and year | Total official financial development (gross disbursement) for water supply and sanitation by recipient as a degree for amount of water and sanitation related to Official Development Assistance that is part of a national government coordinated spending plan per WW production in a country and year. Note, converted from USD/m3 to EUO/m3 with the conversion factor: 0.89 (CoinMill 2019). | Euro / m3 produced wastewater | UN – SDG Indicators 6.a.1 Global Database in Esteve et al. (2017) |
| -What is the level of economic water security? | Economic water security | Composite indicator based on: | N/Av (ratio of max. 20) | (Snethlage u. a. 2018) |
| ·  Coefficient variation of rainfall -years |
| ·  Coefficient variation of rainfall -months |
| ·  Storage Ratio |
| ·  Reliability |
| ·  Water Stress |
| ·  Storage Drought duration length index |
| ·  Data availability counting |
| 🡪 Broad economy index |
| ·  Water productivity in Agriculture |
| ·  Self-sufficiency in Agriculture |
| 🡪 Agriculture index |
| ·  Water productivity in Energy |
| ·  Minimum platform for electricity production |
| 🡪 Energy index |
| -What is the water pricing for agriculture? | Water pricing for agriculture | Tariffs for water use in agriculture | Euro / m3 | (Esteve u. a. 2019) |
| Water Management | -What is the transboundary water dependency ratio? | Transboundary Water Bodies Dependency Ratio in the Northern African region | The dependency water volume ratio between countries in the Northern African region. | % | 2nds Arab State of Water Report in Esteve et al.( 2017) |
| -What is the share of produced volume of industrial and municipal wastewater per total population in a country? | Share of annual produced industrial and municipal wastewater volume per total population in a country | Share of produced water volume by means of industrial and municipal wastewater before treatment per total population, which includes all persons physically present within the present geographical boundaries of countries at the mid-point of the reference period. | m3/(a\*inhabitants) | (Commissariat Regional au Developpement Agricole Nabeul 2016; FAO - UN Food and Agriculture Organisation 2016; Direction Générale du Génie Rural et de l’Exploitation des Eaux 2017; University of Tunis El Manar 2018), own developement |
| - What is the share of treated to produced volume of industrial and municipal wastewater? | Share of annual treated to produced industrial and municipal wastewater | Share of annual treated to produced industrial and municipal wastewater | % | 2nds Arab State of Water Report in (Esteve u. a. 2017)  (Commissariat Regional au Developpement Agricole Nabeul 2016; FAO - UN Food and Agriculture Organisation 2016; Direction Générale du Génie Rural et de l’Exploitation des Eaux 2017; University of Tunis El Manar 2018), own development |
| -What is the share of harvested irrigated crop area per cultivated area? | Percent of total harvested irrigated crop area (full control irrigation) per cultivated area (arable land + permanent crops) | Percent of total harvested irrigated crop area. It refers to the crops grown under full control irrigation . Areas under double irrigated cropping (same area cultivated and irrigated twice a year) are counted twice. Therefore the total area may be larger than the full/partial control equipped area under , which gives an indication of the cropping intensity. The total is only given if information on all irrigated crops in the country is available per cultivate area (arable land area + permanent crops area). | % | (FAO - UN Food and Agriculture Organisation 2016), own development |
| Policy and institutional | -What is the proportion of monitoring and reporting systems in comparison to other countries? | Proportion of monitoring and reporting system between African countries reported on by country | Proportion of monitoring and reporting system between different African countries reported on by country: [%]. | % | (Esteve u. a. 2017) |
| -What is the degree of implementation of national monitoring and reporting system? | Degree of implementation of national monitoring and reporting system | Degree of implementation of national monitoring and reporting system [%]. | % | (FAO - UN Food and Agriculture Organisation 2016) |
| Legislation | - What is the quality of contract enforcement, property rights, and the courts in each country? | World governance index, rule of law | This composite indicator quantifies the ability of a country to abide the quality of contract enforcement, property rights, and the courts | % | (Kaufmann u. a. 2010) |
| - What is the regulation for food and non-food crop irrigation with reclaimed water? | Compliance for food and non-food crop irrigation with reclaimed water | Legal compliance, weather water reclamation in food and non-food crop irrigation is allowed in a country | ranking: yes, partly, no | Own development, and Mueller (2018) |
| Society | -What is the degree of implementation of equitable water and wastewater tariffs? | Degree of implementation of equitable and efficient water supply and wastewater tariffs | Degree of implementation of equitable and efficient water supply and wastewater tariffs in a country. | % | 2nds Arab State of Water Report in Esteve et al. (2017) |
| -What share of population is using improved sanitation services? | Share of using improved sanitation services | Share of using improved sanitation services in a country. | % | UN – SDG Indicator Global Database SDG 6.2.1 in Esteve et al. (2017) |
| Environment | -What is the status of national water reuse regulations for irrigation in comparison with the international BS ISO 16075-2: 2015 water quality guideline? | Compliance of national water reuse regulations for irrigation in comparison with the BS ISO 16072-2:2015 water quality guideline | Compliance of national water reuse regulations e in comparison with the BS ISO 16072-2:2015 water quality guideline | ranking: higher, moderate, lower | Own development, and Mueller (2018) |
| -What is the share of the area equipped for irrigation that has become salinized? | Percent of area equipped for irrigation that has become salinized | Percent of area equipped for irrigation that has become salinized due to mineral build up caused by inadequate drainage. | % | (FAO - UN Food and Agriculture Organisation 2016) |

Table 11: Scoring of water reuse level: lover, moderate, and higher for each indicator. N/Av stands for not available.

| Thematic subject | Key question | Indicator | Unit | Scoring |
| --- | --- | --- | --- | --- |
| Economy | -What is the official financial development assistance (gross expenditure) for water supply and sanitation? | Total official financial development (gross disbursement) assistance for water supply and sanitation for water supply and sanitation by recipient per WW production in a country and year | Euro / m3 produced wastewater | - lower: 0 - 0.33 Euro/m3 - moderate: >0.33 - 0.66 Euro/m3 - higher: 0.66 >= - 1 Euro/m3 |
| -What is the level of economic water security? | Economic water security | N/Av (ratio of max. 20) | - lower: 0 - 6.6 - moderate: <6.6 - 13.2 - higher: <13.2 - 20 |
| -What is the water pricing for agriculture? | Water pricing for agriculture | Euro / m3 | - lower: 0 - 33.3%  - moderate: <33.3 - 66.6%  - higher: <66.6 - 100% |
| Water Management | -What is the transboundary water dependency ratio? | Transboundary Water Bodies Dependency Ratio in the Northern African region | % | - lower: <66.6 - 100% - moderate: <33.3 - 66.6% - higher: 0 - 33.3% |
| -What is the share of produced volume of industrial and municipal wastewater per total population in a country? | Share of annual produced industrial and municipal wastewater volume per total population in a country | m3/(a\*inhabitants) | - lower: <66.6 - 100% - moderate: <33.3 - 66.6% - higher: 0 - 33.3% |
|
|
|
| -What is the treated volume of industrial and municipal wastewater? | Share of annual treated to produced industrial and municipal wastewater | % | - lower: 0 - 33.3% - moderate: <33.3 - 66.6% - higher: <66.6 - 100% |
| -What is the share of harvested irrigated crop area per cultivated area? | Percent of total harvested irrigated crop area (full control irrigation) per cultivated area (arable land + permanent crops) | % | - lower: <66.6 - 100% - moderate: <33.3 - 66.6% - higher: 0 - 33.3% |
| Policy and institutional | -What is the proportion of monitoring and reporting system in comparison to other countries? | Proportion of monitoring and reporting system between African countries reported on by country | % | - lower: 0 - 33.3%  - moderate: <33.3 - 66.6%  - higher: <66.6 - 100% |
| -What is the degree of implementation of national monitoring and reporting system? | Degree of implementation of national monitoring and reporting system | % | - lower: 0 - 33.3% - moderate: <33.3 - 66.6% - higher: <66.6 - 100% |
| Legislation | -What is the quality of contract enforcement, property rights, and the courts in each country? | World governance index, rule of law | % | - lower: 0 - 33.3% - moderate: <33.3 - 66.6% - higher: <66.6 - 100% |
| -What is the regulation for food and non-food crop irrigation with reclaimed water? | Compliance for water reclamation in food and non-food crop irrigation | ranking: yes, partly, no | - lower: yes, food and non-food crops - moderate: partly, non-food crop - higher: no, not allowed |
| Social | -What are the conditions to equitable water and wastewater options? | Degree of implementation of equitable and efficient water supply and wastewater tariffs | % | - lower: 0 - 33.3% - moderate: <33.3 - 66.6% - higher: <66.6 - 100% |
| -What share of population is using improved sanitation services? | Share of using improved sanitation services | % | - lower: 0 - 33.3% - moderate: <33.3 - 66.6% - higher: <66.6 - 100% |
| Environment | -What is the status of national water reuse regulations for irrigation in comparison with the international BS ISO 16075-2: 2015 water quality guideline? | Compliance of national water reuse regulations for irrigation in comparison with the BS ISO 16072-2:2015 water quality guideline | ranking: higher, moderate, lower | - lower: Cat. D, irrigation of industrial and seeded crops: TSS: 140, BOD: 100, TC: no values - moderate: Cat. C, irrigation of non-food crops: TSS: 50, BOD: 35, TC: 10,000 - higher: Cat. A and B, B as the threshold value includes: irrigation of processed food crops: TSS: 25, BOD: 20, TC: 1,000 |
| - What is the share of the area equipped for irrigation that has become salinized? | Percent of area equipped for irrigation that has become salinized | % | - lower: 66.66 – 100% - moderate: < 33.33 – 66.66% - higher: <0 – 33.33% |

Table 12: Investigation of the situation in Egypt, Tunisia, and Moroccorelated to possible wastewater reclamation. N/Av stands for ‘not available’.

| Thematic subject | Key question | Indicator | Result Morocco | Result Tunisia | Result Egypt | Unit | Reference |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Economy | -What is the official financial development assistance (gross expenditure) for water supply and sanitation? | Total official financial development (gross disbursement) assistance for water supply and sanitation for water supply and sanitation by recipient per WW production in a country and year | 0.246 | 0.358 | 0.017 | Euro / m3 produced wastewater | UN – SDG Indicators 6.a.1 Global Database in Esteve et al. (2017) |
| -What is the level of economic water security? | Economic water security | 13.33 | 13 | 15.16 | N/Av (ratio of max. 20) | (Snethlage u. a. 2018) |
| -What is the water pricing for agriculture? | Water pricing for agriculture | 0.15 | 0.04 | 0 | Euro / m3 | (Esteve u. a. 2019) |
| Water Management | -What is the transboundary water dependency ratio? | Transboundary Water Bodies Dependency Ratio in the Northern African region | 0 | 8 | 97 | % | 2nds Arab State of Water Report in Esteve et al. (2017),  (FAO - UN Food and Agriculture Organisation 2016) |
| -What is the share of produced volume of industrial and municipal wastewater per total population in a country? | Share of annual produced industrial and municipal wastewater volume per total population in a country | 29.5 | 42.8 | 119.51 | m3/(a\*inhabitants) | (Commissariat Regional au Developpement Agricole Nabeul 2016; FAO - UN Food and Agriculture Organisation 2016; Direction Générale du Génie Rural et de l’Exploitation des Eaux 2017; University of Tunis El Manar 2018) |
| -What is the share of harvested irrigated crop area per cultivated area? | Percent of total harvested irrigated crop area (full control irrigation) per cultivated area (arable land + permanent crops) | 23.7 | 59.2 | 38.8 | % | 2nds Arab State of Water Report in (Esteve u. a. 2017)  (Commissariat Regional au Developpement Agricole Nabeul 2016; FAO - UN Food and Agriculture Organisation 2016; Direction Générale du Génie Rural et de l’Exploitation des Eaux 2017; University of Tunis El Manar 2018) |
| -What is the share of harvested irrigated crop area per cultivated area? | Total harvested irrigated crop area (full control irrigation) | 18.4 | 8.6 | 185.0 | % | (FAO - UN Food and Agriculture Organisation 2016) |
| Policy and institutional | -What is the proportion of monitoring and reporting system in comparison to other countries? | Proportion of monitoring and reporting system between African countries reported on by country | N/Av | 95.2 | 51.2 | % | (Esteve u. a. 2017) |
| -What is the degree of implementation of national monitoring and reporting system? | Degree of implementation of national monitoring and reporting system | N/Av | 74.5 | 100 | % | (FAO - UN Food and Agriculture Organisation 2016) |
| Legislation | -What is the quality of contract enforcement, property rights, and the courts in each country? | World governance index, rule of law | 48.56 | 56.25 | 32.69 | % | (Kaufmann u. a. 2010) |
| -What is the regulation for food and non-food crop irrigation with reclaimed water? | Compliance for water reclamation in food and non-food crop irrigation | YES | partly | partly | ranking: yes, partly, no | Own development, and (Mueller 2018) |
| Social | -What are the conditions to equitable water and wastewater options? | Degree of implementation of equitable and efficient water supply and wastewater tariffs | N/Av | 58 | 100 | % | 2nds Arab State of Water Report in Esteve et al. (2017) |
| -What share of population is using improved sanitation services? | Share of using improved sanitation services | 76.71 | 91.59 | 94.72 | % | UN – SDG Indicator Global Database SDG 6.2.1 in Esteve et al. (2017) |
| Environment | -What is the status of national water reuse regulations for irrigation in comparison with the international BS ISO 16075-2: 2015 water quality guideline? | Compliance of national water reuse regulations for irrigation in comparison with the BS ISO 16072-2:2015 water quality guideline | lower | higher | lower | ranking: higher, moderate, lower | Own development, and (Mueller 2018) |
| - What is the share of the area equipped for irrigation that has become salinized? | Percent of area equipped for irrigation that has become salinized | 10.4 | 21.83 | N/Av | % | (FAO - UN Food and Agriculture Organisation 2016) |

# Supplementary Materials IV – EXTERNALLY HOSTED SUPPLEMENTARY FILES

Following data, associated metadata and calculation tools are available on the Zenodo repository:

**Decision Support Tool (DST):**

1. **DST and Handbook, version 2.0**: Oertlé, Emmanuel. (2020). Poseidon 2.0 - Decision Support Tool for Water Reuse (Microsoft Excel) and Handbook (Version 2.0) [Data set]. Zenodo. <http://doi.org/10.5281/zenodo.3755380>
2. **DST and Handbook, version 1.1.1**: Oertlé, Emmanuel. (2018, December 5). Poseidon - Decision Support Tool for Water Reuse (Microsoft Excel) and Handbook (Version 1.1.1). Zenodo. <http://doi.org/10.5281/zenodo.3341573>

**Former publication describing the method of the DST in details:**

1. **Publication:** Oertlé E, Hugi C, Wintgens T, Karavitis C, Oertlé E, Hugi C, Wintgens T, Karavitis CA. 2019. Poseidon—Decision Support Tool for Water Reuse. Water. 11(1):153. doi:10.3390/w11010153. [<http://www.mdpi.com/2073-4441/11/1/153>](http://www.mdpi.com/2073-4441/11/1/153) .

**Background Datasets:**

1. **Wastewater Treatment Unit Processes Datasets**: Oertlé, Emmanuel. (2018). Wastewater Treatment Unit Processes Datasets: Pollutant removal efficiencies, evaluation criteria and cost estimations (Version 1.0.0) [Data set]. Zenodo. <http://doi.org/10.5281/zenodo.1247434>
2. **Treatment Trains for Water Reclamation**: Oertlé, Emmanuel. (2018). Treatment Trains for Water Reclamation (Dataset) (Version 1.0.0) [Data set]. Zenodo. <http://doi.org/10.5281/zenodo.1972627>
3. **Water Quality Classes**: Oertlé, Emmanuel. (2018). Water Quality Classes - Recommended Water Quality Based on Guideline and Typical Wastewater Qualities (Version 1.0.2) [Data set]. Zenodo. [<http://doi.org/10.5281/zenodo.3341570>](http://doi.org/10.5281/zenodo.3341570)

# Supplementary Materials V – ESTABLISHMENT OF EXEMPLARY STRATEGIES, BARRIERS AND MEASURES FOR WATER REUSE

In Tables 13, 14 and 15, the detailed scored result, strategy excerpt, identified barriers and measures / (economic) instruments are shown. The scored results very between 1 (lower) to 3 (higher) for which different barriers were identified. These can be overcome by economic and non-economic instruments. The economic instruments include often price based measures. The non-economic include increase enforcement and capacity building in general and increase of number of treatment technology and MADFORWATER technologies.

Table 13: Egypt’s result of multi criteria analysis of different key questions, strategy excerpt, identified barriers and (economic) instruments. The results of the national-level conditions for water reuse assessment. ‘Lower’ national-level conditions for water reuse is in red and equivalent to the score ‘1’, moderate national-level conditions for water reuse in yellow and equivalent to the score ‘2’, ‘higher’ national-level conditions for water reuse in green and equivalent to the score ‘3’. Ts stands for Thematic subject. Ec stands for economy. WM stands for water management. P & I stand for policy and institution. L stands for legislation. S stands for society. En stands for environment. ‘-‘stand for ’no data available‘ or ’not defined.

| **Ts** | **Key question** | **Score detailed** | **Strategy excerpt** | **Identified barrier** | **Measures / instruments**  **(economic)** |
| --- | --- | --- | --- | --- | --- |
| Ec | -What is the **official financial development assistance** (gross expenditure) for water supply and sanitation? | 1 | Financial support is lower | Limited growth based on financial support per WW produced | P2: Subsidies or other financial assistance (e.g. assisted loans) |
| -What is the level of **economic water security**? | 2 | Moderate water security | Improve water security | N1: Insurance  Q1: Quotas (command-and-control)  Q2: Water markets/ water trading |
| -What is the **water pricing for agriculture**? | 1 | Higher for water pricing costs | Water is available too cheap to cover the costs | P1: Pricing/ water tariffs  P3: Taxes |
| WM | -What is the **transboundary water dependency ratio**? | 1 | Higher transboundary water dependency | High water supply dependency on neighbouring countries | P1: Pricing/ water tariffs  P3: Taxes |
| -What is the share of **produced volume** of industrial and municipal wastewater per total population in a country? | 1 | Higher volume of wastewater produced per total population | High volume of wastewater to be treated per population | Q1: Quotas (command-and-control)  Q2: Water markets/ water trading  Non-economic instrument: Capacity building and technology scale up |
| - What is the **share** **of treated to produced volume** of industrial and municipal wastewater? | 2 | Moderate level of treated to produce wastewater volume | Moderate share of treated WW to produced volume, meaning potentially not much water is treated in comparison to available WW | P1: Pricing/ water tariffs for fresh water  P2: Subsidies or other financial assistance (e.g. assisted loans) at the beginning of new technology  Non-economic instrument: Increase of number of treatment technology |
| -What is the share of **harvested irrigated crop area per cultivated area**? | 2 | Moderate share of harvested irrigated crop area per cultivated area | Moderate level of control irrigation per cultivated area. | P1: Pricing/ water tariffs for fresh water  P2: Subsidies or other financial assistance (e.g. assisted loans) at the beginning of new technology  Non-economic instrument: Increase of MADFORWATER technology |
| P&I | -What is the **proportion of monitoring and reporting** system **in comparison to other countries**? | 2 | Moderate proportion of monitoring in international context | Moderate proportion of monitoring in international context | Non-economic instrument: increase enforcement in general |
| -What is the degree of **implementation of national monitoring and reporting** system? | 3 | Compliance with national monitoring and reporting system | No | No |
| L | - What is the **quality of contract enforcement, property rights, and the courts** in each country? | 1 | In international comparison: Lower level of quality of contract enforcement, property rights, and the courts | Lower level of quality of contract enforcement, property rights, and the courts | Non-economic instrument: Increase enforcement in general |
| - What is the **regulation** for food and non-food crop irrigation with reclaimed water? | 2 | Partly compliance with legislation | Not allowed to irrigate non-food crop | Non-economic instrument: Adapt legislation |
| S | -What is the degree of **implementation of equitable water and wastewater tariffs** | 3 | Higher degree of implementation of equitable water and wastewater tariffs | No |  |
| -What share of population is using **improved sanitation services**? | 3 | Wide use of sanitation services | No, yet there is a large amount of treated WW that could be used for water reclamation | P1: Pricing/ water tariffs for fresh water  P2: Subsidies or other financial assistance (e.g. assisted loans) at the beginning for new technologies  P3: Taxes for fresh water  Non-economic instrument: Increase of number of treatment technology incl. MADFORWATER technolgoies |
| En | -What is the status of **national water reuse regulations for irrigation** in comparison with the international BS ISO 16075-2: 2015 water quality guideline? | 1 | Lower compliance | Stricter implementation of regulation and higher compliance with ISO 16075-2 | Non-economic instrument: Increase enforcement in general |
| - What is the share of the **area equipped for irrigation that has become salinized**? | - | N/Av | N/Av | N/Av |

Table 14: Morocco’s result of multi criteria analysis of different key questions, strategy excerpt, identified barriers and (economic) instruments. The results of the national-level conditions for water reuse assessment. ‘Lower’ national-level conditions for water reuse is in red and equivalent to the score ‘1’, moderate national-level conditions for water reuse in yellow and equivalent to the score ‘2’, ‘higher’ national-level conditions for water reuse in green and equivalent to the score ‘3’. Ts stands for Thematic subject. Ec stands for economy. WM stands for water management. P & I stand for policy and institution. L stands for legislation. S stands for society. En stands for environment. ‘-‘stand for ’no data available‘ or ’not defined.

| **Ts** | **Key question** | **Score detailed** | **Strategy excerpt** | **Identified barrier** | **Measures / instruments**  **(economic)** |
| --- | --- | --- | --- | --- | --- |
| Ec | -What is the **official financial development assistance** (gross expenditure) for water supply and sanitation? | 1 | Financial support is lower | Limited growth based on financial support per WW produced | P2: Subsidies or other financial assistance (e.g. assisted loans) |
| -What is the level of **economic water security**? | 2 | Moderate water security | Improve water security | N1: Insurance  Q1: Quotas (command-and-control)  Q2: Water markets/ water trading |
| -What is the **water pricing for agriculture**? | 1 | Higher for water pricing costs | Costs of water pricing is too low to cover the actual costs | P1: Pricing/ water tariffs  P3: Taxes |
| WM | -What is the **transboundary water dependency ratio**? | 3 | Lower transboundary water dependency | No | No |
| -What is the share of **produced volume** of industrial and municipal wastewater per total population in a country? | 3 | Lower volume of wastewater produced per total population | No | No |
| - What is the **share** **of treated to produced volume** of industrial and municipal wastewater? | 1 | High WW treatment potential available | Lower share of treated WW to produced volume, meaning potentially not much water is treated in comparison to available WW | P1: Pricing/ water tariffs for fresh water  P2: Subsidies or other financial assistance (e.g. assisted loans) at the beginning of new technology  Non-economic instrument: Increase of number of treatment technology |
| -What is the share of **harvested irrigated crop area per cultivated area**? | 1 | Lower share of harvested irrigated crop area per cultivated area | Lower share of harvested irrigated crop area per cultivated area | P1: Pricing/ water tariffs for fresh water  P2: Subsidies or other financial assistance (e.g. assisted loans) at the beginning of new technology  Non-economic instrument: Increase of MADFORWATER technology |
| P&I | -What is the **proportion of monitoring and reporting** system **in comparison to other countries**? | - | N/Av | N/Av | N/Av |
| -What is the degree of **implementation of national monitoring and reporting** system? | - | N/Av | N/Av | N/Av |
| L | - What is the **quality of contract enforcement, property rights, and the courts** in each country? | 2 | In international comparison: Moderate level of quality of contract enforcement, property rights, and the courts | Moderate level of quality of contract enforcement, property rights, and the courts | Non-economic instrument: Increase enforcement in general |
| - What is the **regulation** for food and non-food crop irrigation with reclaimed water? | 3 | Compliance with legislation | No | No |
| S | -What is the degree of **implementation of equitable water and wastewater tariffs** | - | N/Av | N/Av | N/Av |
| -What share of population is using **improved sanitation services**? | 3 | Wide use of sanitation services | No, yet there is a large amount of treated WW that could be used for water reclamation | P1: Pricing/ water tariffs for fresh water  P2: Subsidies or other financial assistance (e.g. assisted loans) at the beginning for new technologies  P3: Taxes for fresh water  Non-economic instrument: Increase of number of treatment technology incl. MADFORWATER technolgoies |
| En | -What is the status of **national water reuse regulations for irrigation** in comparison with the international BS ISO 16075-2: 2015 water quality guideline? | 1 | Lower compliance | Stricter implementation of regulation and higher compliance with ISO 16075-2 | Non-economic instrument: Increase enforcement in general |
| - What is the share of the **area equipped for irrigation that has become salinized**? | 3 | Higher share of the area equipped for irrigation that has become salinized | No | No |

Table 15: Tunisia’s result of multi criteria analysis of different key questions, strategy excerpt, identified barriers and (economic) instruments. The results of the national-level conditions for water reuse assessment. ‘Lower’ national-level conditions for water reuse is in red and equivalent to the score ‘1’, moderate national-level conditions for water reuse in yellow and equivalent to the score ‘2’, ‘higher’ national-level conditions for water reuse in green and equivalent to the score ‘3’. Ts stands for Thematic subject. Ec stands for economy. WM stands for water management. P & I stand for policy and institution. L stands for legislation. S stands for society. En stands for environment. ‘-‘stand for ’no data available‘ or ’not defined.

| **Ts** | **Key question** | **Score detailed** | **Strategy excerpt** | **Identified barrier** | **Measures / instruments**  **(economic)** |
| --- | --- | --- | --- | --- | --- |
| Ec | -What is the **official financial development assistance** (gross expenditure) for water supply and sanitation? | 2 | Financial support is moderate | Restricted financial support | P2: Subsidies or other financial assistance (e.g. assisted loans) |
| -What is the level of **economic water security**? | 3 | High water security | No | No |
| -What is the **water pricing for agriculture**? | 1 | Moderate for water pricing | Costs of water pricing is too low to cover the actual costs | P1: Pricing/ water tariffs  P3: Taxes |
| WM | -What is the **transboundary water dependency ratio**? | 1 | Higher transboundary water dependency | High water supply dependency on neighbouring countries | P1: Pricing/ water tariffs  P3: Taxes |
| -What is the share of **produced volume** of industrial and municipal wastewater per total population in a country? | 2 | Moderate wastewater produced per total population | Moderate volume of wastewater to be treated per population | Q1: Quotas (command-and-control)  Q2: Water markets/ water trading  Non-economic instrument: Capacity building and technology scale up |
| - What is the **share** **of treated to produced volume** of industrial and municipal wastewater? | 2 | High WW treatment potential available | Moderate share of treated WW to produced volume, meaning potentially not much water is treated in comparison to available WW | P1: Pricing/ water tariffs for fresh water  P2: Subsidies or other financial assistance (e.g. assisted loans) at the beginning of new technology  Non-economic instrument: Increase of number of treatment technology |
| -What is the share of **harvested irrigated crop area per cultivated area**? | 2 | Moderate share of harvested irrigated crop area per cultivated area | Moderate level of control irrigation per cultivated area. | P1: Pricing/ water tariffs for fresh water  P2: Subsidies or other financial assistance (e.g. assisted loans) at the beginning of new technology  Non-economic instrument: Increase of MADFORWATER technology |
| P&I | -What is the **proportion of monitoring and reporting** system **in comparison to other countries**? | 3 | Higher proportion of monitoring in international context | No | No |
| -What is the degree of **implementation of national monitoring and reporting** system? | 3 | Compliance with national monitoring and reporting system | No | No |
| L | - What is the **quality of contract enforcement, property rights, and the courts** in each country? | 2 | In international comparison: Moderate level of quality of contract enforcement, property rights, and the courts | Moderate level of quality of contract enforcement, property rights, and the courts | Non-economic instrument: Increase enforcement in general |
| - What is the **regulation** for food and non-food crop irrigation with reclaimed water? | 2 | Partly compliance with legislation | Not allowed to irrigate non-food crop | Non-economic instrument: Adapt legislation |
| S | -What is the degree of **implementation of equitable water and wastewater tariffs** | 2 | Moderate degree of implementation of equitable water and wastewater tariffs | Limitations in the implementation of equitable water and wastewater tariffs | Increase enforcement in general |
| -What share of population is using **improved sanitation services**? | 3 | Wide use of sanitation services | No, yet there is a large amount of treated WW that could be used for water reclamation | P1: Pricing/ water tariffs for fresh water  P2: Subsidies or other financial assistance (e.g. assisted loans) at the beginning for new technologies  P3: Taxes for fresh water  Non-economic instrument: Increase of number of treatment technology incl. MADFORWATER technolgoies |
| En | -What is the status of **national water reuse regulations for irrigation** in comparison with the international BS ISO 16075-2: 2015 water quality guideline? | 3 | Compliance | No | No |
| - What is the share of the **area equipped for irrigation that has become salinized**? | 3 | Higher share of the area equipped for irrigation that has become salinized | No | No |