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Social Indicators and Ethics in Sustainable Water Management

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RESEARCH ARTICLE

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Abstract

The article uses the integral model for examining sustainable water management in Danube river basin countries. Within the integral model - indicators measuring the three pillars of sustainability were used. Results show relationship between some of the environmental, economic and socio-cultural indicators of the selected countries. Some of the socio-cultural values might bring a better social understanding of environmental concern and therefore bring motivation for taking responsibility in consumer behaviour or in making sustainable resources management policies. One final conclusion of the study is that a premise of effective and sustainable water management is water ethics and the integration of local community needs.

Keywords

sustainability, water management, ethics, social and cultural indicators

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1 Introduction

The World Commission on Environment and Development introduced the idea of sustainability to the world in 1987. The Brundtland Report (World Commission on Environment and Development, 1987) financed by the United Nations studied the relationship between economic development and environmental changes. It laid the foundation for the „Earth Summit" in 1992 where real international environmental protection initiatives began. Then Brundtland Report defined sustainable development as „meeting the needs of the present generation without compromising the ability of future generations to meet their needs." The official U.N. definition of sustainability has three dimensions: environmental protection, economic development and social equity (World Commission on Environment and Development, 1987; Bulla et al., 2006). However there is still an ongoing discussion what we understand by the terms sustainable development and sustainability (Bándi, 2013).

Since the Brundtland Report there has been much research on environmental issues and sustainability; however mainly by hard science that might not be able to show important factors behind unsustainable management of resources. These missing links could be found by the increasing research in soft sciences (Kates et al., 2005). Growing population, high intensity agricultural production, climate change, etc. are trends that might lead many countries to „water crisis". Therefore water issues and water management techniques are of growing importance. However the complexity of water management issues poses the need for multidisciplinary research. According to the triple bottom line approach (Elkington, 1997; Bulla et al., 2006) of sustainability: sustainable water management needs to be done within all the three (environmental, economic and social) pillars in order to manage water resources in a sustainable way. However environmental, economic, and also some social aspects are rather discussed whilst water ethics (Doorn, 2003) hydrosolidarity (Gerlak et al., 2011) and other human aspects of the social pillar are rather underdeveloped.

Ethics are moral principles governing actions and decisions, and are also guidelines that show right and just actions when facing moral problems. Ethical problems are faced, when each

alternative choice or behaviour has negative ethical or personal consequences, or when right and wrong are difficult to separate (Warner and DeCosse, 2008).

Sustainable development requires ethical framework in the management of all transboundary finite natural resources as "we all depend on one biosphere for sustaining our lives" and as "each community, each country, strive for survival and prosperity with little regards for its impacts on other" (World Commission on Environment and Development, 1987). One of our most precious transboundary resource of society – water - should be equitably accessed by all as a basic fundamental human right and equitably distributed as an economic, social and cultural asset (Rahaman and Varis, 2005). This study shows a new methodology for handling water management issues from a social science perspective.

2 The social pillar of sustainable water management

The social sustainability pillar's one ethical component is socioeconomic fairness. Richer countries consume more than a fair share of resources meaning that they consume more than the planet can provide for all countries. Relating to Warner and DeCosse (2008), wealthier countries can make choices for a more sustainable lifestyle while the poorest nations generally cannot. Ethical sustainability shall be built upon the practice of solidarity with the poor, however it also extends an ethical concern about future generations as we now are compromising their ability to meet their needs.

Relating to our most precious transboundary resource the European Water Association adopted a Code of Ethics (Hagebro and Matthews, 2001) as a set of principles to maintain a sustainable water environment. The EWA agreed that the 29 national member associations should report to the Council meetings on how they implement the following principles at a national level. According to the EWA members of the professional association should maintain a sustainable water environment by for example promoting fair equitable and sustainable use of water resources and taking account of the needs of a diverse environment. Furthermore members should not knowingly or deliberately over-exploit water resources, or damage the water environment. Members shall recognize that in contributing to the provision of water services they provide an important contribution to human well-being. They should embrace the needs of the community and promote the concepts of integration of the management of the wider environment. Members should serve as an example to others for responsible environmental behaviour and should not engage in any corrupt practices. (Hagebro and Matthews, 2001)

In order to realize such ethical principles Kroiss (2002) offers three evaluation schemes for decision making. This way ethics in sustainable management of natural resources can be considered. The first scheme says that each person has his/her own axioms (believes, experiences, convictions, etc.) which results in a specific ranking of values for their decision making. The second describes that logical systems (e.g. legal systems) are based on a restricted number of axioms that have to be assumed or fixed by consent. For example for a legal system it is necessary to reach consensus on a constitution. A specific body of laws enables us to decide whether an action or conclusion is right (compatible with the laws) or wrong (incompatible). As the axioms are subject to continuous innovation deriving from new perceptions and the occurrence of new problems to be solved, also „right" and „wrong" vary over time and from country to country. A typical example is the development of environmental protection legislation during the last decades. The third scheme is that the criterion of a scientific theory or analysis of a situation being „correct" or „false" is the result of a special falsification process. A theory or a scientific analysis is accepted as long as all experimental results (data) are in accordance with the corresponding model of reality.

Kroiss (2002) states that by decision making all three evaluation schemes are actively involved, and that at the end, every decision is based on insufficient information and also on lack of understanding the present situation and the future consequences. Experts may be able to reduce the risk of making wrong decisions, but Kroiss assumes that it is still not clear to which extent we can contribute to the increase of material and energy utilisation efficiency and what are the limiting factors. However the aim to make optimal use of all the available resources drives natural ecosystems as well as the cultural development of human societies (Kroiss, 2002). This development also includes the human contribution to global development due to rational thinking, innovative, new ideas and growing consciousness of self.

Using a common questionnaire, the World Values Survey[1], a global network of social scientists, started a study in 1981 consisting of nationally representative surveys. By now six waves of the survey have been done, with surveys conducted in about 100 countries that contain about 90 percent of the world's population. They studied changing values and their impact on social and political life. It is the largest global, non-commercial analyses of human values. The surveys seek to provide a comprehensive measurement of human concern in religion, politics, economic and social life.

The results show two main value dimensions that dominate countries. Depending on the dominating value system decisions are made differently. The dominating values system therefore strongly effects sustainable development policies in each country. Next figure shows that the four dominating value dimensions are the traditional/secular-rational and the survival/self-expression values.

Societies scoring higher in traditional values emphasize the importance of parent-child ties and the deference to authority.

1 www.worldvaluessurvey.org

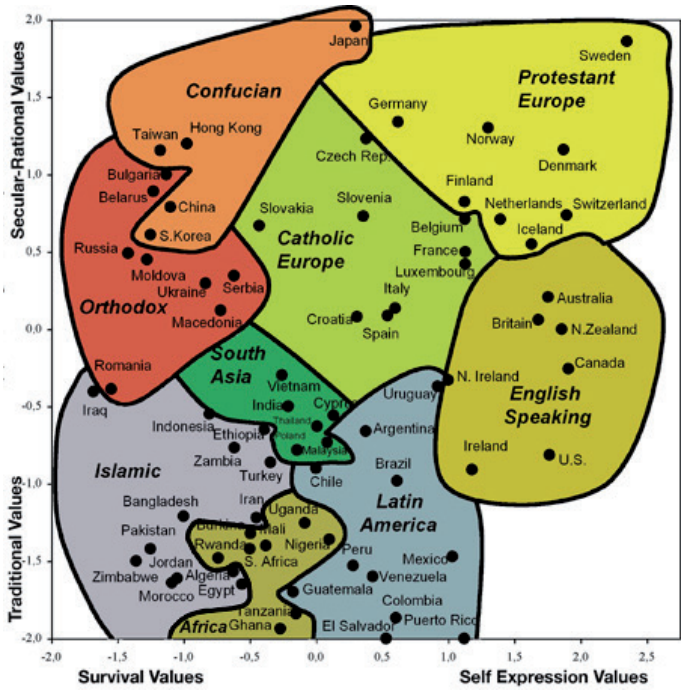

Fig. 1 The World Value Survey Cultural Map 2005-2008 (Inglehart and Welzel, 2010)

Here absolute standards and traditional family values are important. These societies tend to reject divorce, homosexuality, abortion, euthanasia and suicide. People rather have a nationalistic outlook. Secular-rational values dominated societies have opposite preferences on these issues. The difference between survival and self-expression values is explained through the fact that new generations of certain countries have grown up taking survival for granted. This population has more self-expression values because its priorities have been shifting from the importance of economic security towards subjective – wellbeing and quality of lifeaccording to Inglehart and Welzel (2010).

When industrialized countries go through modernization and aim to become a knowledge society, they shift orientation from traditional towards secular-rational and from survival towards self-expression values (Inglehart and Welzel, 2010). This process also involves the polarization between materialist and postmaterialist values, reflecting a cultural shift that is emerging among generations who didn't have to worry about survival. Self-expression values give high priority to environmental protection, tolerance of diversity and rising demands for participation in decision making in economic and political life. These values also reflect mass polarization over tolerance of outgroups. The shift from survival values to self-expression values also includes a shift in child-rearing values: the important values to teach a child shift from emphasis on hard work towards emphasis on imagination and tolerance. It also involves a rising sense of subjective well-being that is conducive to an atmosphere of tolerance, trust and political moderation. Finally, societies that are ranked high on self-expression values also tend to be ranked high on interpersonal trust.

This produces a culture of trust and tolerance in which people set a relatively high value on individual freedom and self-expression, and have active political orientation. These are precisely the attributes that the political culture literature defines as 'crucial to democracy'.

This study presents a new model of integrating factors of sustainable use of resources, economic welfare and also socio-cultural development. Representing the socio-cultural development I used the theory of postmaterialist value change (initially developed by Inglehart in the 1970s). This theory says that among Western populations a slow, but powerful change of priorities from materialist towards postmaterialist values is taking place through generational replacement (Inglehart, 1997). Figure 1 shows materialist values in the secular-rational but survival value dimension whilst postmaterialist values exist in the secular-rational and self expression dimension. According to Inglehart's theory, the reason for changing priorities is the changing level of economic well-being and existential security. The older cohorts experienced economic scarcity and the uncertainties of two world wars. Cohorts born in the post war period experienced affluence and a more peaceful environment. Economic well-being and the sense of existential security increased, and as a consequence, citizens developed new priorities. Economic growth and the fight against crime rates were no longer in focus. The new generation began to prioritize issues such as freedom of speech, environmental protection, political participation and liveable cities. Later on a broader stream of cultural change happened and is still happening towards postmodern values. In some wealthier nations the latitude for individual choice of lifestyles and self-expression is on the increase, quality of life becoming more important than mere economic growth. Citing Inglehart and Welzel (2010): "self-expression values give high priority to environmental protection, tolerance of diversity and rising demands for participation in decision making in economic and political life." However, the „shift from materialism to postmaterialism" brings new possibilities for sustainable use of resources as well.

Although values become "greener" - behaviour can end up in causing even more harm to the environment. Rebound effect shows that saved energy and resources by consuming environmentally friendly products can end up in producing other products for "greener" consumption. Also "rich countries tend to have higher levels of domestic material consumption than poor countries and higher physical imports" therefore sustainability has to be analysed globally in order not to miss important facts such as possible exploitation of poorer nations for sustaining richer countries' consumption patterns (Steinberger et al., 2010).

Straatsma et. al (2009) applied a socio-cultural values related water management model on the geomorphology and ecology of lower Rhine floodplains. The experts developed and evaluated scenarios for river management strategies by integrating psychology and sociology with ecology and geomorphology.

They have translated socio-cultural values driven scenarios into specific spatial layouts of landscaping measures. According to the study the current dominant value system in the Netherlands, with its consensual attitude and attention for ecology and landscape diversity can be considered as a rather postmaterialist value system. Thus the experts proposed three different scenarios that might be accepted by the Dutch society.

3 Methodology

Human capabilities, priorities, creative thoughts, etc. can be interpreted as individual factors partly determined by socio-cultural development. Analysing the management of transboundary resources we tried to map socio-cultural factors first (Fűr and Ijjas, 2012). For a sustainable management of water resources, socio-cultural priorities such as water ethics need to be addressed. I used the model of integral water management for this purpose. I laid down the model's fundamentals by developing the integral theory (Esbjörn-Hargens, 2005; Ijjas and Valkó, 2011). To represent the integral theory I collected and mapped the main problems of sustainability offered by hard science as well as soft science.

Table 1 Theories behind the problematics of sustainability, mapped in the integral model

Soft factors	Hard factors
The evolution of scientific theories, industrialization, changing religions, ideologies and ethics	Ecological overshoot
Consumer habits	Water scarcity
Hierarchy of needs	Crossing planetary boundaries
Shadow work	Loss of biodiversity
Environmental control-, and stress theory	Irreversible processes of climate change
4 stress theory	Unsustainable nature of monetary systems
Technology addiction theory	Population growth
Reaction to environmental risks theory	Growing consumption needs of wealthier societies
Low-Cost- High-Cost-theory	Unbalanced distribution of resources
Neurotic society	Unsustainable consumption behaviour
Relative maturity of society	Agroimperialism
Integral theory	Problems with week sustainability
Integral ecology	Decoupling of economics
Psychopathologies	Absolute scarcity
Socio-cultural development	Rebound effect
Personality development	Large-scale corporate-controlled activities
Psychosocial development	

Similarly, integral water management can be defined as an integral concept that works with the physical, chemical, biological, ecological, and also the economic, social, legal, and cultural aspects of water systems. These relate to different human values and needs such as access to safe water, water justice, well-being, etc.

Table 2 The Integral water management model (Ijjas, 2014)

Soft factors	Hard factors
1. Safety, ecological health of the group	1. good status of hydrosystems
2. Mental health of the group	2. good status of ecosystems
3. Social cohesion, tolerance, democracy, justice	3. sustainable socio-economic and legal systems

This study shows the results of the analysis of the Danube river basin countries' water management sustainability. The integral water management model (Ijjas, 2014) was applied. The concept of integral water management is to add socio-cultural indicators to the widespreadly used integrated water management methods. Socio-cultural and economic indicator groups with indicators for water management and environmental impact have been chosen to present the three pillars of sustainability. Sustainable water management of the chosen Danube river basin countries is therefore analysed throughout these indicator groups. The main aim of the research was to find links between socio-cultural and water management data. Table 3 shows the indicators and their data sources. The countries were given scores of -2, -1, 0, 1, 2 for every indicator data (see Appendix A and Appendix B). These standardized scores were then summed up for each country. A higher score represents higher economic potential; higher environmental and water management potential; and higher socio-cultural potential. The three potential scores were then summed up resulting in the sustainable water management potential for each country (see Appendix E).

Limiting factor of the research is that the indicators are - due to lack of the multidisciplinary scientific knowledge – not weighted, which raised the potential for getting distorted results. According to the integral water management model, the chosen indicators are the following:

4 Findings

Economic potential. Upstream countries have higher economic potential. Germany and Austria have far higher scores than the other countries. They are followed by Slovakia, than Hungary, Croatia, Romania, Bulgaria, Serbia and Bosnia-Herzegovina. Austria has the highest scores in all aspects, whilst Germany has a higher unemployment rate and higher military expenditures. (The scores of Hungary are mostly low due to low GDP, high unemployment rate, high military expenditures and high poverty rate.)

Table 3 Integral water management indicators – Danube river basin countries

Soft factors	Hard factors
Indicators used for socio-cultural potential	**Indicators used for environmental and water management potential**
1. Experienced well-being (source: Happy Planet Index (HPI)) (The New Economics Foundation, 2012)	1. Rate of sewage treated domestic wastewater (Rajnai, 2012)
2. Civil liberties (source: Global Peace Index (GPI)) (The Institute for Economics and Peace, 2012)	2. Ecological status,
3. Neighboring country relations (source: GPI)	3. and chemical status (Vízügyi és Környezetvédelmi Központi Igazgatóság, 2010)
4. Self-destructivity (suicide rate for males per 100,000 population[2])	4. Nitrogen emission,
5. Political participation (source: GPI)	5. and phosphorus emission (Vízügyi és Környezetvédelmi Központi Igazgatóság, 2010)
6. Risk of slavery (source: Global Slavery Index (GSI))[3]	6. Water footprint (m3/capita/year) (Mekonnen et al., 2011)
7. Postmaterialism (source: WVS)[3]	7. Ecological footprint (Global Footprint Network, 2012)
	Indicators used for economic potential
	1. GDP/capita/year[5]
	2. Functioning of government (source: GPI)
	3. Unemployment rate (Statistics Division of the Department of Economic and Social Affairs, 2012)
	4. Political-economic instability (source: GPI)
	5. Military expenditure (source: GPI)
	6. Corruption[6]
	7. Risk of poverty or social exclusion[7]

Sustainable resources management potential. Austria has the highest sustainable resources management potential. Austria is followed by Germany, Slovakia, Hungary and Bulgaria. Croatia, Romania and Serbia scored much worse, although Austria, Germany and Slovakia have higher ecological footprints; a research with weighted indicators might show different results. (Hungary has its worst scores in water footprint and phosphorus emissions.)

Socio-cultural potential. Germany and Austria scored far higher than the other countries due to higher experienced well-being, a high existence of civil liberties, better neighbouring country relations and widespread postmaterialist values. The study shows that there might be a correlation between environmental potential, economic potential, sustainability potential and the "maturity" of the given society. The exception is Croatia, where postmaterialist values scored relatively high, yet the country does not have a high sustainability potential. (In this respect Hungary is behind almost all of the other countries, only Serbia scored worse. Male suicide rates in Hungary are far the highest and there is a lack of postmaterialist values.)

It seems that upstream countries tend to have higher GDP, lower risk of poverty, lower unemployment and a higher rate of democracy. Within their boundaries, upstream countries also tend to have a better chemical status of the river Danube, however there is no major difference regarding the ecological status of the water bodies. Furthermore, upstream countries seem to have higher life satisfaction values, longer life expectation, lower corruption rate, higher peace- and higher civil liberties index. These nations also have less traditional authority values and more secular rational values, less survival values and more well-being values.

5 Conclusion

The results show that countries with higher economic potential tend to have higher sustainable management potential and also higher socio-cultural potential. Socio-cultural values seem to be explanatory variables whilst sustainable resources management is to be seen as a response. Postmaterialist societies therefore might have a higher potential for sustainable water management. However, more profound research and statistical analyses is needed to prove that. Therefore the validity of results is plant to be tested in other international river basins such as the Jordan and the Nile river basin.

2 http://www.who.int/mental_health/evidence/atlas/profiles/en/index.html
3 http://globalslaveryindex.org
4 http://www.wvsevsdb.com/wvs/WVSAnalize.jsp
5 http://unstats.un.org/unsd/snaama/resQuery.asp
6 http://www.transparency.org/cpi2012/in_detail
7 http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/People_at_risk_of_poverty_or_social_exclusion

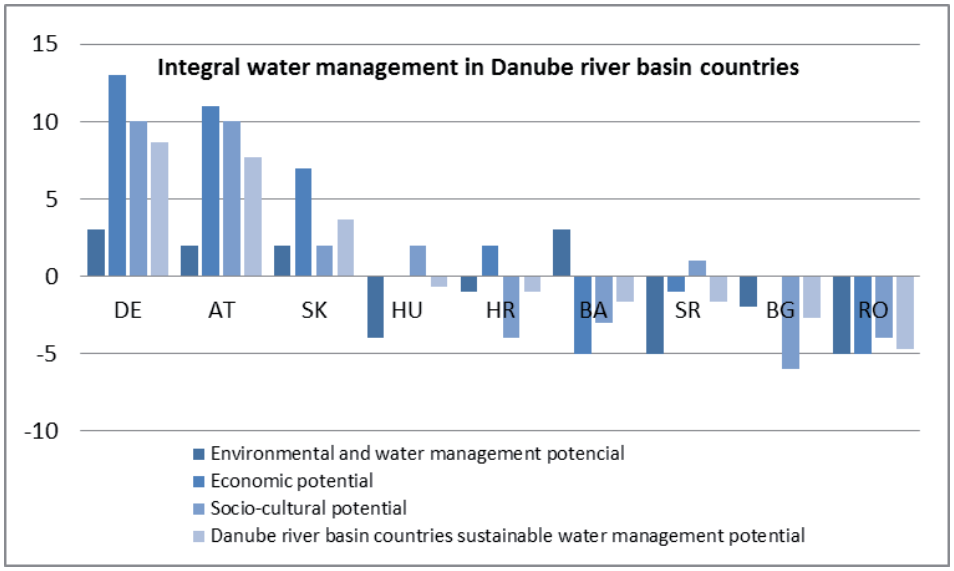

Fig. 2 Integral water management in Danube river basin countries

In Hungary, applying integral water management could bring a new understanding to some of the politicized economic and environmental issues. For decades the case of the Gabcikovo-Nagymaros hydroelectric dam has been causing serious financial and biodiversity loss for Hungary. The value system that has changed due to political system changes resulted in beliefs that hinder any solution of the prevailing situation. The attitude against the case of Gabcikovo-Nagymaros may be the cause for decreasing hydropower utilization, although this would be necessary for a sustainable and effective energy policy.

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Appendix A

Indicators for socio-cultural potential in Danube river basin countries

Danube river basin countries	Indicators for socio-cultural potential						
	Experienced well-being	Civil liberties	Neighboring country relations	Self-destructivity	Political participation	Risk of slavery	Postmaterialism
DE	6,7	9,1	1.0	17,9	37,4%	15,27	15,1
AT	7,3	9,1	1,0	23,8	30,9%	7,74	29,6
SK	6,1	9,1	2,0	22,3	31,6%	25,58	4
HU	4,7	8,2	1,3	42,3	11,1%	34,9	2,4
HR	5,6	8,2	2,0	26,9	x	34,3	19,2
BA	4,7	7,6	2,0	x	x	45,09	4,6
SR	4,5	7,4	3,0	28,4	x	36,83	6,1
BG	4,2	x	x	19,7	3,2%	30,52	3,2
RO	4,9	8,2	1,0	x	x	35,96	7,1

Appendix B

Standardization results of socio-cultural indicator data in Danube river basin countries

Danube river basin countries	Indicators for socio-cultural potential							
	Experienced well-being	Civil liberties	Neighboring country relations	Self-destructivity	Political participation	Risk of slavery	Postmaterialism	Summ.
DE	2	2	2	1	2	0	1	10
AT	2	2	2	0	1	1	2	10
SK	1	2	0	0	1	-1	-1	2
HU	0	1	1	-2	-1	-1	-2	-4
HR	1	1	0	0	x	-1	1	2
BA	0	0	0	x	x	-2	-1	-3
SR	0	0	-1	-1	x	-1	-1	-4
BG	-1	x	x	0	-2	-1	-2	-6
RO	0	1	2	x	x	-1	-1	1

Appendix C

Indicators for economic potential in Danube river basin countries

Danube river basin countries	Indicators for economic potential						
	GDP/capita/year	Functioning of government	Unemployment rate	Political instability	Military expenditure	Risk of poverty or social exclusion	Corruption
DE	43865	8,2	7,4%	1.0	1,4	19,6%	8.0
AT	49686	7,9	4,8%	1,0	1,2	18,5%	7,8
SK	17546	7,5	12,1%	1,0	1,3	20,5%	4,0
HU	13919	6,1	10%	1,5	2,0	32,4%	4,6
HR	14 217	5,7	9,1%	2,3	1,5	32,3%	4,0
BA	4807	3,3	24,1%	2,9	1,4	x	3,2
SR	5579	4,6	13,6%	2,9	1,6	x	3,3
BG	7187	x	x	x	x	49,3%	x
RO	8853	6,1	6,9%	2,0	1,4	41,7%	3,6

Appendix D

Indicators for environmental and water management potential in Danube river basin countries

Danube river basin countries	Water management					Environment	
	Rate of sewage treated domestic wastewater	Ecological status	Chemical status	N (kgt/year)	P (kgt/year)	Water footprint (m3/cap./year)	Ecol. footprint
DE	95	40	100	12,3	1	1426	4,6
AT	91,7	60	100	9,5	0,8	1598	5,3
SK	55	80	100	11,4	1,7	1335	4,7
HU	54	70	80	14,7	2,8	2384	3,6
HR	24	30	30	10,9	2,8	1688	4,2
BA	1,7	X	X	7,3	1,6	1256	2,7
SR	11	40	50	16	2,9	2390	2,6
BG	64	50	10	6,5	1,3	2297	3,6
RO	31	50	10	69,3	11,5	1689	2,8

Appendix E

Sustainable water management potential of Danube river basin countries

Danube river basin countries	Sustainable resources management potential	Economic potential	Socio-cultural potential	Danube river basin countries sustainable water management potential
DE	2	11	10	23
AT	3	13	10	26
SK	2	7	2	11
HU	-4	0	2	-2
HR	-1	2	-4	-3
BA	3	-5	-3	-5
SR	-5	-1	1	-5
BG	-2	0	-6	-8
RO	-5	-5	-4	-14