

Indicator name	Groundwater development as share of total actual renewable water resources
Prepared by	UNESCO-IHP
Example	WWDR2, Chapter 4, Table 4.3 See annexed table
Rationale	The quantity of groundwater used in total in proportion to the recharge illustrates to what degree a nation's is exploiting its groundwater water resources.
Position in DPSIR chain	State
Definition of indicator	Groundwater abstraction as a percent of the groundwater recharge component of the Total Actual Renewable Water Resources (TARWR). The quantity of groundwater resources used by major sectors (municipal, agricultural, industrial) as percentage of the groundwater recharge component (GAR) of TARWR.
Underlying definitions and concepts	Abstraction involves all withdrawals and does not differentiate by sector.
Specification of determinants needed	TARWR Groundwater Annual Recharge in km ³ per year (GAR linked to TARWR INDEX parameter) Groundwater Abstraction in km ³ per year by Country
Computation	100 (groundwater abstraction) / (groundwater recharge)
Units of measurements	km ³ /year Result expressed as percentages of TARWR, SWAR, GAR
Data sources, availability and quality	Abstraction – documented data or estimated from knowledgeable sources. The source for the abstraction is a number determined by data collected or estimated from data sources for various countries (122 countries as of October 2005). Source quantities for TARWR and Groundwater Annual Recharge (GAR) are available from FAO.
Scale of application	Country level.
Geographical coverage	Global (within the context of the available data)
Interpretation	<p>This indicator can be used to evaluate whether there is potential for further development of groundwater resources or whether groundwater resources are overexploited. As a limitation, it has to be understood that volumes of renewed water resources cannot be directly related to volumes of water theoretically available on a sustainable basis.</p> <p>The indicator can help policy-makers and water users understand their management options and scenarios. It can also provide early warning on excessive use of groundwater resource, which may trigger other impacts like deterioration in water quality and related social and economic consequences.</p> <p>Data on groundwater abstraction are mostly available, because in many countries permits for groundwater abstraction are obligatory and water supply wells have to be registered. Data from domestic wells are usually based on qualified estimation.</p> <p>Depending on the source, the value provided under groundwater resources in the AQUASTAT database (“groundwater produced internally”) may indicate either the groundwater recharge or the groundwater productivity.</p> <p>Variations:</p> <p>The indicator could be calculated more specifically distinguishing the groundwater uses by different sectors (is mentioned above, see definition of the indicator).</p> <p>Analogously for surface water, quantity of surface water used can be expressed as a percentage of the surface runoff (SWAR) to indicate the degree to which a</p>

	<p>country is using its surface water resources.</p> <p>Suggested future development: Criteria for sustainable exploitation of groundwater resources should be designed, inclusive of ecological attributes and social and economic constraints, and for good status of groundwater resources, preserving both quantitative and qualitative aspects as far as practicable.</p>
Linkage with other indicators	Total actual renewable water resources (TARWR)
Alternative methods and definitions	To be developed.
Related indicator sets	FAO AQUASTAT databases. Groundwater resources sustainability indicators, editors J.Vrba and A. Lipponen, UNESCO Series on Groundwater (2006).
Sources of further information	FAO AQUASTAT: http://www.fao.org/ag/agl/aglw/aquastat/dbase/index3.jsp?radio4=y&cont=%25&country=%25&search=Display (Accessed 03 March 2009) IGRAC: http://www.igrac.net/ (Accessed 03 March 2009) Definitions of the different water resources variables can be found it the AQUASTAT glossary at http://www.fao.org/nr/water/aquastat/data/glossary/search.html (Accessed 03 March 2009)
Other institutions involved	FAO, UNESCO IHP, Bureau of Geological and Mining Research (BRGM), UN Economic Commission for Europe (UNECE)