

D4.6 All publications on website



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Introduction

SUBSOL is part of the Horizon2020 open research and data initiative. One major objective of the SUBSOL project is to accelerate the market penetration of sub surface water technologies by developing practical tools showcasing different solutions at replication sites. One important component of the success of the project is to ensure that generated knowledge is exchanged among the consortium and transferred to external stakeholders for the purpose of bridging the gap between science and practice.

In order to share the experiences and scientific knowledge around SWS technology as well as sharing lessons learned about the implementation of these systems a number of materials have been published throughout the project. The target audience of each publication depends on the respective subject. The publications range by the level of detail from easily understandable high level brochures and presentations to detailed scientific research papers and posters. Many of the publication were peer reviewed, which increases the accessibility to SUBSOL project knowledge and the awareness towards project activities in general. Beyond knowledge sharing, the dissemination of project results was also meant to build up trust among prospective end-users of SWS technologies. To give an overview on the different outputs of the project, a list of all formal publications is provided in the following deliverable.

All publications can be accessed on the SUBSOL website by this link:

<http://www.subsol.org/results>

Papers and scientific reports

Title:	Adapted subsurface water solutions across continents
Date of publication	Handed in for publication
Type of publication	Paper
Organisation(s)	adelphi
Author(s)	Anika C. Conrad, Maike März, Ronjon Chakrabarti
Keywords	Sustainable water management, subsurface water solutions, aquifer storage and recovery, innovative water technologies
Executive Summary	<p>Temporary water scarcity and salt water intrusion in coastal aquifers are problems which are common in various parts of the world and can be addressed with subsurface water solutions (SWS). SWS comprise of various intelligent well and sensor configurations for different hydrogeological aquifer conditions. They can be seen as a combination of aquifer storage, (treatment), and recovery (AS(T)R), managed aquifer recharge (MAR), and various water reuse options including rainwater harvesting or treated waste water usage. The technology transfer of SWS, which are implemented in the Netherlands, is following an approach of a participatory co-design with key stakeholders and institutions. The developed methodology mainly consists of two missions, which are being applied to four target regions: Brazil, Mexico, Vietnam, and Cyprus. In these regions stakeholders are identified, framework conditions are assessed, public events and project development workshops are conducted in order to adapt the technology and implementation approach to the specific requirements. General drivers and barriers are identified for institutional, political, and legal as well as socio-economic aspects. General</p>

	implementation concepts are developed, their prerequisites concluded, and research project ideas are elaborated.
Link	=

Title:	A Novel Hybrid Photocatalytic System for water purification: application to groundwater remediation and aquifer recharging
Date of publication	28.06.2018
Type of publication	Paper
Organisation(s)	Greener than Green Technologies, NTUA, Geoservice
Author(s)	C. Christophoridis, E. Bizani, D. Iossifidis, A.Kallioras, K.Dimitriadis, C. Makropoulos
Keywords	purification, groundwater, photocatalytic
Executive Summary	A novel hybrid remediation system has been developed, incorporating a photocatalytic reactor coupled with Reverse Osmosis (RO). The system was constructed and operated in pilot scale, in order to ensure the recharge of a nearby aquifer with pure and desalinated water. The system is remotely monitored and operated, so as to be tested and operated in remote locations.
Link	http://www.subsol.org/uploads/deliverables/abstract_GtG_SPEA_10.pdf

Title:	Sustainable coastal agriculture, conference in Tangshan China
Date of publication	17.10.2017

Type of publication	Conference paper
Organisation(s)	adelphi
Author(s)	J. Bunsen
Keywords	sustainable coastal agriculture conference abstract tangshin china
Executive Summary	<p>Coastal areas are the most productive and economically dominant regions in the world. High water demand in these regions however, puts tremendous pressure on coastal freshwater resources and ecosystems. This leads to problems like seasonal water shortages, saltwater intrusion, and deterioration of freshwater dependent ecosystems such as wetlands. Building on national, regional and European research and innovation programs, in the past five years, a set of innovative, practical concepts has been developed for protection, enlargement and utilization of freshwater resources in coastal areas. These subsurface water solutions (SWSs) combine innovations in water well design and configuration, allowing for advanced groundwater management, and maximum control over freshwater resources. SWSs have successfully been piloted by public-private partnerships. Full-scale pilots have demonstrated the capacity of SWSs to support sustainable, economic and energyefficient freshwater supply and food production in coastal areas. Various similarities exist between SWS implementation sites in Europe and the northern Chinese coastline (e.g. along the Bohai Bay) such as strong within-year variation of precipitation, growing demand for freshwater which is partially satisfied by groundwater abstraction and intrusion of seawater. Hence, SWSs may also enable end-users in China to take control of their fresh groundwater resources and spur sustainable agriculture and other socioeconomic activities. By demonstration, market</p>

	<p>replication, standardization and commercialisation, SUBSOL targets a market breakthrough of SWSs as a robust answer to the challenges freshwater resources face in coastal areas. SUBSOL's ambition is to introduce a paradigm shift in water resources management as well as to promote sustainable development of coastal areas worldwide.</p>
<p>Link</p>	<p>http://www.subsol.org/uploads/deliverables/Abstract_20170816.pdf</p>

<p>Title:</p>	<p>Observations and Prediction of Recovered Quality of Desalinated Seawater in the Strategic ASR Project in Liwa, Abu Dhabi</p>
<p>Date of publication</p>	<p>16.03.2017</p>
<p>Type of publication</p>	<p>Paper</p>
<p>Organisation(s)</p>	<p>KWR, Waterfocus, TU Delft, EAAD</p>
<p>Author(s)</p>	<p>Stuyfzand, Smidt, Zuurbier, Hartog, Dawoud</p>
<p>Keywords</p>	<p>ASR; water quality; aquifer storage and recovery</p>
<p>Executive Summary</p>	<p>To be able to overcome water shortages, Abu Dhabi Emirate started an Aquifer Storage and Recovery (ASR) project with desalinated seawater (DSW) as source water near Liwa. It is the largest DSW-ASR project in the world (stored volume ~10 Mm³/year), and should recover potable water for direct use. DSW is infiltrated into a desert dune sand aquifer using “sand-covered gravel-bed” recharge basins. In this study, we evaluate the hydrogeological and hydrogeochemical stratification of the (sub)oxic target aquifer, and water quality changes of DSW during trial infiltration runs. We predict water quality changes of DSW after 824 d of infiltration, during 90 d of intensive recovery</p>

	<p>(67% recovered) without storage (scenario A), as well as after 10 years of storage (scenario B, with significant bubble drift). Monitoring of preceding trials revealed a lack of redox reactions; little carbonate dissolution and Ca/Na exchange; much SiO₂ dissolution; a strong mobilization of natural AsO₄³⁻, B, Ba, F, CrO₄²⁻, Mo, Sr and V from the (sub)oxic aquifer; and immobilization of PO₄, Al, Cu, Fe and Ni from DSW. The Easy-Leacher model was applied in forward and reverse mode including lateral bubble drift, to predict water quality of the recovered water. We show that hydrogeochemical modeling of a complex ASR-system can be relatively easy and straightforward, if aquifer reactivity is low and redox reactions can be ignored. The pilot observations and modeling results demonstrate that in scenario A recovered water quality still complies with Abu Dhabi's drinking water standards (even up to 85% recovery). For scenario B, however, the recovery efficiency declines to 60% after which various drinking water standards are exceeded, especially the one for chromium</p>
<p>Link</p>	<p>http://www.subsol.org/uploads/deliverables/Stuyfzand_et_al.,_2017_-_Observations_and_prediction_of_Recovered_Quality_of_Desalinated_Seawater_in_the_Strategic_ASR_project_in_Liwa,_Abu_Dhabi_.pdf</p>

<p>Title:</p>	<p>Reactive transport impacts on recovered freshwater quality during multiple partially penetrating wells (MPPW-)ASR in a brackish heterogeneous aquifer</p>
<p>Date of publication</p>	<p>10.03.2017</p>
<p>Type of publication</p>	<p>Paper</p>

Organisation(s)	KWR
Author(s)	Stuyfzand, Zuurbier, Hartog
Keywords	ASR-coastal, Nootdorp, water quality, subsurface water solutions
Executive Summary	<p>The use of multiple partially penetrating wells (MPPW) during aquifer storage and recovery (ASR) in brackish aquifers can significantly improve the recovery efficiency (RE) of unmixed injected water. The water quality changes by reactive transport processes in a field MPPW-ASR system and their impact on RE were analyzed. The oxic freshwater injected in the deepest of four wells was continuously enriched with sodium (Na⁺) and other dominant cations from the brackish groundwater due to cation exchange by repeating cycles of ‘freshening’. During recovery periods, the breakthrough of Na⁺ was retarded in the deeper and central parts of the aquifer by ‘salinization’. Cation exchange can therefore either increase or decrease the RE of MPPW-ASR compared to the RE based on conservative Cl⁻, depending on the maximum limits set for Na⁺, the aquifer’s cation exchange capacity, and the native groundwater and injected water composition. Dissolution of Fe and Mn-containing carbonates was stimulated by acidifying oxidation reactions, involving adsorbed Fe²⁺ and Mn²⁺ and pyrite in the pyrite-rich deeper aquifer sections. Fe²⁺ and Mn²⁺ remained mobile in anoxic water upon approaching the recovery proximal zone, where Fe²⁺ precipitated via MnO₂ reduction, resulting in a dominating Mn²⁺ contamination. Recovery of Mn²⁺ and Fe²⁺ was counteracted by frequent injections of oxygen-rich water via the recovering well to form Fe and Mn-precipitates and increase sorption. The MPPWASR strategy exposes a much larger part of the injected water to the deeper geochemical units first, which may therefore control the mobilization of undesired elements</p>

	during MPPW-ASR, rather than the average geochemical composition of the target aquifer.
Link	http://www.subsol.org/uploads/deliverables/Zuurbier et al (2016) - RTM on recovered freshwater quality during MPPW-ASR in a brackisch aquifer.pdf

Title:	Consequences and mitigation of saltwater intrusion induced by short-circuiting during aquifer storage and recovery in a coastal subsurface
Date of publication	10.03.2017
Type of publication	Paper
Organisation(s)	KWR
Author(s)	P.J. Stuyfzand, K.G. Zuurbier
Keywords	ASR-coastal, MPPW, short-circuiting, subsurface water solutions, Westland
Executive Summary	Coastal aquifers and the deeper subsurface are increasingly exploited. The accompanying perforation of the subsurface for those purposes has increased the risk of shortcircuiting of originally separated aquifers. This study shows how this short-circuiting negatively impacts the freshwater recovery efficiency (RE) during aquifer storage and recovery (ASR) in coastal aquifers. ASR was applied in a shallow saltwater aquifer overlying a deeper, confined saltwater aquifer, which was targeted for seasonal aquifer thermal energy storage (ATES). Although both aquifers were considered properly separated (i.e., a continuous clay layer prevented rapid groundwater flow between both aquifers), intrusion of deeper saltwater into the shallower aquifer quickly terminated the freshwater recovery.

	<p>The presumable pathway was a nearby ATES borehole. This finding was supported by field measurements, hydrochemical analyses, and variable-density solute transport modeling (SEAWAT version 4; Langevin et al., 2007). The potentially rapid short-circuiting during storage and recovery can reduce the RE of ASR to null. When limited mixing with ambient groundwater is allowed, a linear RE decrease by short-circuiting with increasing distance from the ASR well within the radius of the injected ASR bubble was observed. Interception of deep short-circuiting water can mitigate the observed RE decrease, although complete compensation of the RE decrease will generally be unattainable. Brackish water upconing from the underlying aquitard towards the shallow recovery wells of the ASR system with multiple partially penetrating wells (MPPW-ASR) was observed. This “leakage” may lead to a lower recovery efficiency than based on current ASR performance estimations.</p>
Link	http://www.subsol.org/uploads/deliverables/hess-21-1173-2017.pdf

Title:	Increasing Freshwater Recovery upon Aquifer Storage (PhD thesis)
Date of publication	19.04.2016
Type of publication	PhD thesis
Organisation(s)	KWR, TU Delft
Author(s)	K.G. Zuurbier
Keywords	ASR, aquifer storage and recovery, recovery efficiency, ASR-coastal, Freshmaker

Executive Summary

The subsurface may provide opportunities for robust, effective, sustainable, and cost-efficient freshwater management solutions. For instance, via aquifer storage and recovery (ASR; Pyne, 2005): “the storage of water in a suitable aquifer through a well during times when water is available, and the recovery of water from the same well during times when it is needed”. This can be successful in storing and recovering both potable and irrigation water. ASR is attractive due to the limited space requirements above ground and the generally successful conservation of water quality (Maliva and Missimer, 2010). The recovery efficiency (RE) of ASR is defined as the part of the injected water that can be recovered with a satisfying quality. Several factors can limit the RE during ASR in brackish-saline aquifers, such as the simultaneous abstraction of injected freshwater and ambient, more saline groundwater. This can be a result of ‘bubble drift’, which happens when the infiltrated bubble is transported away from the ASR well by the local or regional hydraulic gradient. However, the RE can be particularly limited in brackish–saline aquifers by the density difference between the injected freshwater and ambient brackish or saline groundwater. This is because this density difference causes the freshwater to float upwards in the aquifer (‘buoyancy effect’), while denser saline water is recovered by lower parts of the well (Esmail and Kimbler, 1967; Merritt, 1986; Ward et al., 2007). Both water types are thus blended in the ASR well to produce a brackish, generally unsuitable water quality. Freshwater availability is more and more stressed in coastal areas, where brackish and saline groundwater is commonly present. Therefore, the ability to increase the RE of ASR systems provides a true benefit because it would significantly amplify the potential of freshwater management. The general objective of this study is therefore to quantify and increase the performance

	(indicated by RE) of relatively small-scale ASR systems in areas with brackish-saline groundwater, taking into account recently developed well configurations for performance optimization.
Link	http://www.subsol.org/uploads/deliverables/LR-Thesis_KoenZuurbier.pdf

Title:	How Subsurface Water Technologies (SWT) can Provide Robust, Effective, and Cost-Efficient Solutions for Freshwater Management in Coastal Zones
Date of publication	04.04.2016
Type of publication	Paper
Organisation(s)	KWR, TU Delft, Vitens
Author(s)	K.G. Zuurbier, K.J. Raat, M. Paalman, A. Oosterhof, P.J. Stuyfzand
Keywords	Aquifer storage and recovery, Freshkeeper, Freshmaker, Coastal aquifers, Freshwater, Salinization, Seasonal water shortage, Subsurface water technologies
Executive Summary	Freshwater resources in coastal zones are limited while demands are high, resulting in problems like seasonal water shortage, overexploitation of freshwater aquifers, and seawater intrusion. Three subsurface water technologies (SWT) that can provide robust, effective, and cost-efficient solutions to manage freshwater resources in the subsurface are evaluated using groundwater modelling and validation at field-scale: (1) ASR-coastal to store freshwater surpluses in confined brackish-saline aquifers for recovery in times of demand, (2) the Freshkeeper to counteract salinization of well fields by interception and desalination of upconing brackish groundwater, and (3) the

	<p>Freshmaker to combine ASR and Freshkeeper to enlarge the volume of natural freshwater lenses for later abstraction. The evaluation indicates that SWT can be used in various hydrogeological settings for various hydrogeological problems like seawater intrusion, upconing, and bubble drift during ASR and have significant economic benefits. Although only sporadically applied to date, we foresee that SWT will stimulate (cost-)efficient and sustainable exploitation of various freshwater sources (like groundwater, rainwater, treated waste water, surface water) in coastal zones. Prolonged SWT testing in the current pilots, replication of SWT in other areas worldwide, and the development of technical and non-technical support tools are required to facilitate potential end-users in investment decision making and SWT implementation</p>
<p>Link</p>	<p>http://www.subsol.org/uploads/deliverables/Zuurbier et al (2016) - How SWT can provide robust, effective, and cost-efficient solution for freshwater management.pdf</p>

<p>Title:</p>	<p>Innovatieve putconcepten maken zoetwaterreservoir in verzilte ondergrond mogelijk</p>
<p>Date of publication</p>	<p>19.04.2016</p>
<p>Type of publication</p>	<p>Paper</p>
<p>Publication website</p>	<p>H2O Online, 11 March 2017 https://www.h2owaternetwerk.nl/</p>
<p>Organisation(s)</p>	<p>KWR, TU Delft</p>
<p>Author(s)</p>	<p>K.G. Zuurbier</p>
<p>Keywords</p>	<p>ASR, aquifer storage and recovery, recovery efficiency, ASR-coastal, Freshmaker</p>

Link

[http://www.subsol.org/uploads/deliverables/Zuurbier et al. \(2015\) -
_Innovatieve_putconcepten_maken_zoetwaterreservoir_in_verzilde_ondergrond_mogelijk_.pdf](http://www.subsol.org/uploads/deliverables/Zuurbier_et_al._(2015)_-_Innovatieve_putconcepten_maken_zoetwaterreservoir_in_verzilde_ondergrond_mogelijk_.pdf)

Posters

Title:	A Novel Hybrid Photocatalytic System for water purification
Date of publication	26.06.2018
Type of publication	Poster
Organisation(s)	Greener than Green Technologies, NTUA, Geoservice
Author(s)	C. Christophoridis, E. Bizani, D. Iossifidis, A.Kallioras, K.Dimitriadis, C. Makropoulos
Keywords	groundwater, remediation, aquifer recharging, hybrid, photocatalytic, water purification
Link	http://www.subsol.org/uploads/deliverables/SPEA10_GtG.pdf

Conferences

Date	Name	Location
3 - 5 November 2015	Web Summit	Dublin, Ireland
14 April 2016	Spaarwater symposium	Gouda, The Netherlands
17 - 22 April 2016	EGU 2016	Vienna, Austria
17 May 2016	Adaptation Futures Rotterdam	Rotterdam, The Netherlands
20 - 22 June 2016	ISMAR 9	Mexico City, Mexico
28 - 30 June 2016	Toward Sustainable Groundwater in Agriculture - An International Conference Linking Science and Policy	Burlingame/San Francisco, California
9 - 14 September 2016	World water Congress	Brisbane, Australia
9 - 13 October 2016	IWA World Water Conference and Exhibition (WWCE)	Brisbane, Australia
17 January 2017	Sustainable World Food Supply	Amersfoort, The Netherlands
29 March 2017	WSTA 12th Gulf Water Conference	Manama, Kingdom of Bahrain
23 - 28 April 2017	EGU 2017	Vienna, Austria
18 - 21 September 2017	Water Security and Climate Change	Cologne, Germany
25 - 26 September 2017	An Innovative Pattern towards a Productive and Profitable Coastal Agriculture	Tangshan, China

27 - 29 September 2017	EIP	Porto, Portugal
9 October 2017	Duurzaam watermanagement in de polders	Bruges, Belgium
15 - 17 November 2017	International Environmental Engineering Conference (IEEC 2017)	Jeju, Korea
27 February 2018	Kindra Final Conference	Brussels, Belgium
17 May 2018	COASTAR	Scheveningen (The Hague), NL
4 - 8 June 2018	SPEA10 10th European meeting on solar chemistry and photocatalysis: environmental applications	Almeria, Spain
12 June 2018	Promoting market- Ready water innovations: Investor café	Brussels, Belgium
17 June 2018	25th Salt water Intrusion meeting	Gdansk, Poland

Presentations

Title:	SubSol. Secure freshwater availability. At all times. (EASME Investor Café. Promoting market-ready water innovations. Brussels)
Date of publication	29.06.2018
Type of publication	Presentation
Organisation(s)	KWR
Author(s)	Klaasjan Raat
Keywords	Subsurface water solutions, Freshwater supply, Economy, Investors, Market uptake
Link	http://www.subsol.org/uploads/deliverables/20180612_-_SUBSOL_EASME_Investor_cafe.pdf
Conference details	Promoting market- Ready water innovations: Investor café (12 June 2018, Brussels, Belgium) https://ec.europa.eu/easme/en/news/promoting-market-ready-water-innovations-investors-caf

Title:	Recent developments in ASR, MAR and reuse in NL, for drinking water and agriculture (SubSol technical meeting, Sultan Qaboos University, Muscat, Oman)
Date of publication	28.06.2018
Type of publication	Presentation
Organisation(s)	KWR, BGR, Sultan Qaboos University
Author(s)	Klaasjan Raat, Koen G. Zuurbier, Gerard v.d. Berg

Keywords	ASR, MAR and reuse, Middle East, drinking water
Link	http://www.subsol.org/uploads/deliverables/20180604 - _Subsol technical meeting - Sultan Qaboos University - _ASR MAR reuse NL.pdf

Title:	Aquifer Storage & Recovery (ASR) to enable water reuse by greenhouse horticulture (IECC conference, Jeju Korea)
Date of publication	28.06.2018
Type of publication	Presentation
Organisation(s)	KWR
Author(s)	Klaasjan Raat, Koen G. Zuurbier, Gerard v.d. Berg
Keywords	Water reuse, Subsol, ASR-Coastal
Link	http://www.subsol.org/uploads/deliverables/20171114 - _IECC Jeju Korea - ASR enabling reuse - Raat.pdf
Conference details	2017 International Environmental Engineering Conference & annual Meeting of the Korean society of Environmental Engineers, Innovative Technologies and Climate Change Adaptation (15-17 November 2017, Jeju, Korea) http://www.ieec2017.org/

Title:	Subsurface water solutions. An overview (Water Security and Climate Change Conference, Cologne)
Date of publication	28.06.2018
Type of publication	Presentation

Organisation(s)	KWR, Adelphi, GEUS, NTUA
Author(s)	Koen Zuurbier
Keywords	Subsurface water solutions, ASR-Coastal, Freshmaker, Freshkeeper
Link	http://www.subsol.org/uploads/deliverables/20170918_-_WSCC_Session_Innovative_subsurface_water_solutions_(SW_S)_Zuurbier.pdf
Conference details	Water Security and Climate Change Cologne (18-21 September 2017, Cologne, Germany) https://www.th-koeln.de/hochschule/water-security-and-climate-change-conference_41153.php

Title:	The Economic and Operational Potential of Subsurface Water Solutions for Freshwater Management (IWA World Water Congress & Exhibition, Brisbane)
Date of publication	28.06.2018
Type of publication	Presentation
Organisation(s)	KWR, Adelphi, GEUS, NTUA
Author(s)	Gerard van den Berg, Klaasjan Raat, Koen Zuurbier, Klaus Hinsby, Christos Makropoulos, Cosima Stahr, Ronjon Chakrabarti
Keywords	Subsurface water solutions, Economy, Freshwater
Link	http://www.subsol.org/uploads/deliverables/20161013_-_presentation_IWA_conference_vdBerg_et_al.pdf
Conference details	IWA World Water Conference and Exhibition (9-13 October 2016 , Brisbane, Australia)

	http://www.iwa-network.org/events/world-water-congress-exhibition-2016/
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Title:	Drivers for uptake of ASR by the greenhouse industry in NL (IWA World Water Congress & Exhibition, Brisbane)
Date of publication	28.06.2018
Type of publication	Presentation
Organisation(s)	KWR
Author(s)	Klaasjan Raat
Keywords	Subsurface water solutions, Economy, Freshwater, Market uptake
Link	http://www.subsol.org/uploads/deliverables/20161013_-_Pitch_Klaasjan_IWA_conference_workshop.pdf
Conference details	IWA World Water Conference and Exhibition (9-13 October 2016 , Brisbane, Australia) http://www.iwa-network.org/events/world-water-congress-exhibition-2016/

Title:	Freshkeeper - Fallbeispiele für technische Lösungen zur Gewährleistung der Versorgungssicherheit bei (zunehmender) Salzwasserbelastung der Grundwasserleiter (INTWA Osnabrück)
Date of publication	28.06.2018
Type of publication	Presentation
Organisation(s)	KWR, Arcadis
Author(s)	Klaasjan Raat, Jobst Herlitzius

Keywords	Subsurface water solutions, Freshkeeper, Freshmaker, ASR, Market uptake
Link	http://www.subsol.org/uploads/deliverables/20160420_-_Freshkeeper_-_INTWA_Osnabruck_English.pdf
Conference details	Wasserversorger INTWA Interessengemeinschaft norddeutsche Wasserbetriebe (20 April 2016, Osnabrück Deutschland) https://www.intwa.de/index.php?id=139

Title:	Kindra Final Conference
Date of publication	22.03.2018
Type of publication	Presentation
Organisation(s)	NTUA
Author(s)	Klio MonoKrousou
Keywords	Knowledge Environmental Potential links
Link	http://www.subsol.org/uploads/deliverables/12.-SUBSOL_KE_.pdf
Conference details	Kindra final conference (27 February 2018, Brussels, Belgium) https://eurogeologists.eu/kindra-final-conference/

Title:	Target region presentations from the mission series: Mexico Yucatan
Date of publication	22.06.2017
Type of publication	Presentation
Organisation(s)	Adelphi; BGR

Author(s)	Jonas Bunsen, Ronjon Chakrabarti, Juan Carlos Santoyo, Maike Groschke
Keywords	target region mission series
Link	http://www.subsol.org/uploads/deliverables/Presentation_Subsol_Vietnam.pdf

Title:	Target region presentations from the mission series: China
Date of publication	22.06.2017
Type of publication	Presentation
Organisation(s)	Adelphi; BGR
Author(s)	Jonas Bunsen, Ronjon Chakrabarti, Juan Carlos Santoyo, Maike Groschke
Keywords	target region mission series
Link	http://www.subsol.org/uploads/deliverables/Presentation_Subsol_China.pdf

Title:	Target region presentations from the mission series: Cyprus
Date of publication	22.06.2017
Type of publication	Presentation
Organisation(s)	Adelphi; BGR
Author(s)	Jonas Bunsen, Ronjon Chakrabarti, Juan Carlos Santoyo, Maike Groschke
Keywords	target region mission series
Link	http://www.subsol.org/uploads/deliverables/Presentation_Subsol_Cyprus.pdf

_Cyprus.pdf

Title:	Target region presentations from the mission series: Mexico Mandeadero
Date of publication	22.06.2017
Type of publication	Presentation
Organisation(s)	Adelphi; BGR
Author(s)	Jonas Bunsen, Ronjon Chakrabarti, Juan Carlos Santoyo, Maike Groschke
Keywords	target region mission series
Link	http://www.subsol.org/uploads/deliverables/Presentation_Subsol_Mexico_Maneadero.pdf

Title:	Target region presentations from the mission series: Brasil
Date of publication	22.06.2017
Type of publication	Presentation
Organisation(s)	Adelphi; BGR
Author(s)	Jonas Bunsen, Ronjon Chakrabarti, Juan Carlos Santoyo, Maike Groschke
Keywords	target region mission series
Link	http://www.subsol.org/uploads/deliverables/Presentation_Subsol_Brasil.pdf

Title:	Increasing freshwater recovery upon aquifer storage in brackish-saline aquifers: what can hydrogeological
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engineering bring?	
Date of publication	25.06.2016
Type of publication	Conference presentation
Organisation(s)	KWR, TU Delft
Author(s)	K.G. Zuurbier, P.J. Stuyfzand, N. Hartog
Keywords	ASR-coastal, Freshmaker, Dinteloord, MAR
Link	http://www.subsol.org/uploads/deliverables/20160622_ISMAR9_Koen_Zuurbier.pdf
Conference details	<p>ISMAR-9 (20 - 22 June 2016, Mexico-City)</p> <p>https://srala.org/eventos/9th-international-symposium-on-managed-aquifer-recharge-ismar9-mexico-city-20-22-june-2016/</p>

Title:	Freshwater supply: the subsurface to the rescue (presentation Adaptation Futures Rotterdam)
Date of publication	17.05.2016
Type of publication	Conference presentation
Organisation(s)	KWR, TU Delft
Author(s)	Koen G. Zuurbier, Gerard v.d. Berg, Klaasjan Raat
Keywords	Subsol, Freshmaker, ASR-Coastal, Climate Adaptation
Link	http://www.subsol.org/uploads/deliverables/20160509_Subsurface_to_the_rescue.pdf
Conference details	<p>Adaptation Futures Rotterdam (17 May 2016, Rotterdam, The Netherlands)</p> <p>http://www.adaptationfutures2016.org/</p>

Title:	Spaarwater symposium, 14-4-2016: A guide on infiltration and recovery (in Dutch)
Date of publication	21.04.2016
Type of publication	Conference presentation
Organisation(s)	KWR
Author(s)	Koen Zuurbier
Keywords	Spaarwater, ASR, infiltration, recovery efficiency, regulation, Handreiking
Link	http://www.subsol.org/uploads/deliverables/Zuurbier_KWR_infiltreren_en_terugwinnen_(Handreiking).pdf
Conference details	Spaarwater symposium (14 April 2016, Gouda, The Netherlands) http://www.spaarwater.com/nw-27227-7-3615548/nieuws/uitnodiging_spaarwater_symposium_2016.html

Newsletters, guides and brochures

Title:	SubSol newsletter October 2017
Date of publication	10.10.2017
Type of publication	Newsletter
Link	http://www.subsol.org/uploads/deliverables/SuBSol_Newsletter - October 2017.htm

Title:	SubSol Brochure in Chinese
Date of publication	22.06.2017
Type of publication	Presentation
Organisation(s)	KWR, Adelphi, Alphafilm
Author(s)	All
Keywords	subsurface water solutions, subsol, backgrounds, aims, introduction
Link	http://www.subsol.org/uploads/deliverables/SUBSOL_CN_digital .pdf

Title:	SubSol newsletter march 2017
Date of publication	13.04.2017
Type of publication	Newsletter
Author(s)	SubSol partners
Keywords	subsurface water solutions, subsol, backgrounds, aims, introduction
Link	http://www.subsol.org/uploads/deliverables/SUBSOL_NEwslette

	r.htm
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Title:	Technical and legal ASR guide / Technisch-Juridische Handreiking ondergrondse waterberging
Date of publication	13.04.2016
Type of publication	Guide
Organisation(s)	KWR, AcaciaWater, Deltares, Sterk Consulting
Author(s)	Zuurbier et al.
Keywords	risk-assessment, ASR, infiltration, water quality
Link	http://www.subsol.org/uploads/deliverables/STOWA_2015_35_-_Handreiking_OWB.pdf

Title:	Subsol Brochure
Date of publication	03.03.2016
Type of publication	Brochure
Organisation(s)	KWR, Adelphi, Alphafilm
Author(s)	All
Keywords	subsurface water solutions, subsol, backgrounds, aims, introduction
Link	http://www.subsol.org/uploads/deliverables/SUBSOL1.pdf

Deliverables

Title:	D5.1 Draft data management plan
Date of publication	18.04.2017
Type of publication	Deliverable
Organisation(s)	KWR, NTUA
Author(s)	Gerard van Den Berg, Christos Makropoulos, George Karavokiros
Keywords	data management plan
Link	http://www.subsol.org/uploads/deliverables/D5.1_update_data_management_plan_.pdf

Title:	D4.6 All publications on website
Date of publication	28.09.2018
Type of publication	Deliverable
Organisation(s)	Adelphi
Author(s)	Maike März, Ronjon Chakrabarti
Keywords	publications, subsol
Link	http://www.subsol.org/uploads/deliverables/D4.6_All_Publications_4th_version_20182809_.pdf

Title:	D4.5 Promotional film
Date of publication	23.02.2017
Type of publication	Deliverable
Organisation(s)	Alphafilm

Keywords	film SubSol
Link	http://www.subsol.org/uploads/deliverables/D4.5_promotional_film_.pdf

Title:	D4.4 Communication and dissemination plan
Date of publication	06.03.2017
Type of publication	Deliverable
Organisation(s)	Adelphi
Author(s)	Jonas Bunsen, André Müller, Cosima Stahr and Ronjon Chakrabarti
Keywords	communication and dissemination, data management plan, film
Link	http://www.subsol.org/uploads/deliverables/D4.4_Communication_and_dissemination_plan_final_clean_20170305_.pdf

Title:	D4.3 Lessons learned from trust building activities
Date of publication	12.12.2017
Type of publication	Deliverable
Organisation(s)	Adelphi
Author(s)	Ronjon Chakrabarti, Elsa Semmling, Jonas Bunsen, Anika Conrad, Juan Carlos Santoyo Campos, Jeremy Lhoir
Keywords	development, prospects, application of Subsurface Water Solutions (SWS), target regions, strategy, international market uptake
Link	http://www.subsol.org/uploads/deliverables/D4_3_Lessons_learned_finaldraft_MG.pdf

Title:	D4.3 Mission Series - Ho Chi Minh City, Vietnam
Date of publication	09.09.2018
Type of publication	Deliverable
Keywords	mission serie, Ho Chi Minh City, Vietnam
Link	www.subsol.org/uploads/deliverables/Report_Vietnam_HoChiMinh_SubSolwebsite_final_20180524_(1).pdf
Title:	D4.3 Mission Series – Recife, Brazil
Date of publication	09.09.2018
Type of publication	Deliverable
Keywords	mission serie, Recife, Brazil
Link	www.subsol.org/uploads/deliverables/Report_MissionIVBrazi_SubSolwebsite_20180319.pdf
Title:	D4.3 Mission Series - Guadalupe Valley and San Quintín, Mexico
Date of publication	09.09.2018
Type of publication	Deliverable
Keywords	mission serie, Guadalupe Valley, San Quintin, Mexico
Link	www.subsol.org/uploads/deliverables/Report_Guadalupe_SanQuint%C3%ADn_SubSolwebsite_20180319.pdf
Title:	D4.3 Mission Series – Cyprus
Date of publication	09.09.2018
Type of publication	Deliverable
Keywords	mission serie, Cyprus
Link	www.subsol.org/uploads/deliverables/Report_Cyprus_SubSolwebsite_20180528_(1).pdf

Title:	D4.3b Lessons learned from trust building activities - Addition
Date of publication	05.09.2018
Type of publication	Deliverable
Organisation(s)	BGR, KWR
Author(s)	Maïke Gröschke, Ralf Klingbeil, Klaasjan Raat
Keywords	lessons learned, trust building, addition to D4.3
Link	www.subsol.org/uploads/deliverables/D4.3b Lessons learned from trust building activities - GCC countries .pdf

Title:	D4.2 Policy briefs and Solution packages for SWS stakeholders
Date of publication	30.11.2017
Type of publication	Deliverable
Organisation(s)	DBT
Author(s)	Ditte Degnbol; Josefine Bennike Jakobsen; Søren Gram; Andreas Hastrup Clemmensen ; Helle Henriksen ; Katrine Georg Rasmussen
Keywords	participatory Technology Assessment
Link	http://www.subsol.org/uploads/deliverables/d4.2_Subsol_A_Step-by-Step_Guide_to_Stakeholder_Involvement .pdf

Title:	D4.2a Safeguarding the water reserves of Ho Chi Minh City, Vietnam
Date of publication	09.09.2018
Type of publication	Deliverable

Keywords	safeguarding, water reserves, Ho Chi Minh City, Vietnam
Link	www.subsol.org/uploads/deliverables/Policy_Brief_Vietnam_engelsk_net.pdf
Title:	D4.2b Safeguarding the water reserves of Baja California, Mexico
Date of publication	09.09.2018
Type of publication	Deliverable
Keywords	safeguarding, water reserves, Baja California, Mexico
Link	www.subsol.org/uploads/deliverables/Policy_Brief_mexico_engelsk_net.pdf
Title:	D4.2c Safeguarding the water reserves of Cyprus
Date of publication	09.09.2018
Type of publication	Deliverable
Link	www.subsol.org/uploads/deliverables/Policy_Brief_Cyprus_engelsk_net.pdf
Title:	D4.2d Safeguarding the water reserves of Laizhou Bay, China
Date of publication	09.09.2018
Type of publication	Deliverable
Keywords	safeguarding, water reserves, Laizhou Bay, Chine
Link	www.subsol.org/uploads/deliverables/Policy_Brief_China_engelsk_net.pdf
Title:	D4.2e Safeguarding the water reserves of Pernambuco, Brazil
Date of publication	09.09.2018

Type of publication	Deliverable
Keywords	safeguarding, water reserves, Pernambuco, brazil
Link	www.subsol.org/uploads/deliverables/Policy_Brief_brazil_engels_k_net.pdf

Title:	D3.3 The Online SWS platform
Date of publication	30. 10.10.2017
Type of publication	Deliverable
Organisation(s)	NTUA, Ubitech, KWR
Author(s)	Anastasios Zafeiropoulos, George Karavokiros, Klio Monokrousou, Christos Makropoulos
Keywords	SWS online web-based platform
Link	http://www.subsol.org/uploads/deliverables/D3.3 the online sw_s_platform_.pdf

Title:	D3.2 The SWS toolkit
Date of publication	10.10.2017
Type of publication	Deliverable
Organisation(s)	NTUA
Author(s)	George Karavokiros, Chris Pantazis, Evangelos Rozos, Andreas Kallioras, Klio Monokrousou, Christos Makropoulos
Keywords	hydro-technical SWS decision support toolkit
Link	http://www.subsol.org/uploads/deliverables/D_3_2_SUBSOL_SWS_Toolkit_v1_(2).pdf

Title:	D3.1 A web-based knowledge environment
Date of publication	23.02.2017
Type of publication	Deliverable
Organisation(s)	BGR, NTUA
Author(s)	Georg Houben, Maike Groschke, Christos Makropoulos, George Karavokiros, Klio Monokrousou
Keywords	EIP water market place
Link	http://www.subsol.org/uploads/deliverables/D3.1 SUBSOL KE .PDF

Title:	D2.9 Road map for full scale implementation of SWS at Maneadero Valley, Mexico
Date of publication	26.09.2018
Type of publication	Deliverable
Organisation(s)	Arcadis
Author(s)	Viviana Rangel, Toon Boonekamp
Keywords	road map, full scale implementation, SWS, Maneadero Valley, Mexico
Link	http://www.subsol.org/uploads/deliverables/D2.9 - _Roadmap for full- scale implementation in Maneadero Valley .pdf

Title:	D2.7 Feasibility study and pilot design for Maneadero Valley, Mexico t
Date of publication	10.09.2018

Type of publication	Deliverable
Organisation(s)	Arcadis, KWR
Author(s)	Viviana Rangel, Beatriz de la Loma, Steven Ros
Keywords	feasibility study, pilot design, Maneadero Valley, Mexico
Link	www.subsol.org/uploads/deliverables/D2.7_Feasibility_study_and_pilot_design_for_Maneadero_Valley_Mexico_.pdf

Title:	D2.6 Guide on using ASR-Coastal with treated wastewater for irrigation
Date of publication	06.09.2018
Type of publication	Deliverable
Organisation(s)	KWR
Author(s)	Dr. Koen Zuurbier, Teun van Dooren MSc, Steven Ros MSc
Keywords	ASR-coastal, treated wastewater, irrigation
Link	www.subsol.org/uploads/deliverables/D2.6 - _Guide on using ASR- Coastal with treated wastewater for irrigation .pdf

Title:	D2.5 completed demonstration of the use of extensively treated wastewater for ASR Coastal
Date of publication	23.02.2017
Type of publication	Deliverable
Organisation(s)	KWR
Author(s)	Koen Zuurbier
Keywords	ASR coastal, Dinteloord

Link	http://www.subsol.org/uploads/deliverables/d2.5_Second_ASR_well_Dinteloord_under_construction_.pdf
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Title:	D2.4 Guide on integrated SWS, water treatment, and ICT application in karstic aquifer
Date of publication	17.05.2018
Type of publication	Deliverable
Organisation(s)	NTUA, Geoservice, GtG
Author(s)	Christos Makropoulos, Klio Monokrousou, Andreas Kallioras, Klisthenis Dimitriadis, Dimitri Iossifidis
Keywords	karstic aquifer, landscapes, integrated SWS, water treatment, ICT application
Link	http://www.subsol.org/uploads/deliverables/D2.4_Guide_on_SW_S_.pdf

Title:	D2.3 Full implementation of SWS pilot test site in confined fractured chalk aquifer in Falster Island (TRL5)
Date of publication	16.05.2017
Type of publication	Deliverable
Organisation(s)	NTUA
Author(s)	Christos Makropoulos
Keywords	full implementation, sws pilot, aquifer
Link	http://www.subsol.org/uploads/deliverables/D2.3_schinias_.pdf

Title:	D2.2 Road map for full scale implementation of SWS for
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fractured chalk aquifer)	
Date of publication	05.09.2018
Type of publication	Deliverable
Organisation(s)	GEUS
Author(s)	Klaus Hinsby, Rasmus Jakobsen, Per Rasmussen, Torben Sonnenborg, Helle U. SØ, Jens Aamand, Stig SA Pedersen, Christian Knudsen, Urse Scheel Krüger, Søren Gram, Henrik Andersen, Nicklas S. Rasmussen
Keywords	road map, full scale implementation, SWS
Link	www.subsol.org/uploads/deliverables/D2.2 - _Road map for full scale implementation of SWS for fractu red chalk aquifer .pdf

Title:	D2.1 Full implementation of SWS pilot test site in confined fractured chalk aquifer in Falster Island (TRL5)
Date of publication	20.04.2017
Type of publication	Deliverable
Organisation(s)	GEUS
Author(s)	Klaus Hinsby
Keywords	SWS pilot test; Falster Island; Aquifer
Link	http://www.subsol.org/uploads/deliverables/d2.1.pdf

Title:	D1.7 Technological and Economical guide for ASR-Coastal application)
Date of publication	06.09.2018
Type of publication	Deliverable
Organisation(s)	KWR
Author(s)	Dr. Koen Zuurbier, Teun van Dooren MSc
Keywords	technological, economical guide, ASR, coastal
Link	www.subsol.org/uploads/deliverables/D1.7 - _Technological and Economical guide for ASR- Coastal application .pdf

Title:	D1.6 – Improved ASR-Coastal Reference site
Date of publication	25.06.2018
Type of publication	Deliverable
Organisation(s)	KWR
Author(s)	Dr. Koen Zuurbier, Teun van Dooren MSc, Steven Ros MSc
Keywords	ASR, Coastal reference, Nootdorp, Westland
Link	http://www.subsol.org/uploads/deliverables/D1.6 - TRL8 - _ASR-Coastal .pdf

Title:	D1.5 – Technological and Economical guide for Freshmaker application
Date of publication	05.09.2018
Type of publication	Deliverable
Organisation(s)	KWR

Author(s)	Koen Zuurbier, Teun van Dooren, Beatriz de la Loma Gonzalez, Steven Ros
Keywords	technological, economical, freshmaker, application
Link	www.subsol.org/uploads/deliverables/D1.5 - _Technological and Economical guide for Freshmaker applic ation .pdf

Title:	D1.4 Improved Freshmaker Reference site
Date of publication	25.06.2018
Type of publication	Deliverable
Organisation(s)	KWR
Author(s)	Dr. Koen Zuurbier, Teun van Dooren MSc, Steven Ros MSc
Keywords	freshmaker, reference site
Link	http://www.subsol.org/uploads/deliverables/D1.4 - TRL8 - _Freshmaker .pdf

Title:	D1.3/D1.5/D1.7/D2.6 Compilation of Technological and Economical Guides
Date of publication	05.09.2018
Type of publication	Deliverable
Organisation(s)	KWR
Author(s)	Dr. Koen Zuurbier, Dr. Klaasjan Raat, Teun van Dooren MSc
Keywords	compilation, technological, economical, guides
Link	www.subsol.org/uploads/deliverables/D1.3D1_.5D1_.7D2_.6 - _SWS Technological and Economical guides -

Introduction .pdf

Title:	D1.2 – Improved Freshkeeper Reference site (TRL7)
Date of publication	26.06.2018
Type of publication	Deliverable
Organisation(s)	Vitens, KWR
Author(s)	Ate Oosterhof, Sjoerd Rijpkema, Annemieke van Doorn, Teun van Dooren
Keywords	freshkeeper, reference site, wells
Link	http://www.subsol.org/uploads/deliverables/D1.2_Improved_Freshkeeper_Reference_site_(TRL7).pdf

Title:	D1.1 Validated regional scale groundwater model Noardburgum
Date of publication	16.05.2017
Type of publication	Deliverable
Organisation(s)	Vitens
Author(s)	Ate Oosterhof
Keywords	Noardburgum, validated groundwater
Link	http://www.subsol.org/uploads/deliverables/D1.1_.pdf