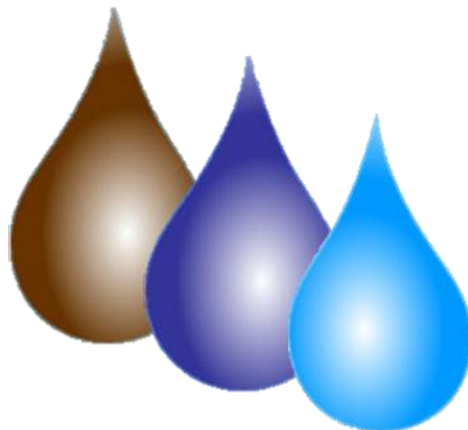


# Sustainable Wine Production Toolkit

## “WATER”



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## **Introduction:**

The world around us today has very much become a structured environment, often dictated to by social demands. In the world of viticulture & oenology, it's no different. By taking a quick glance through any of the journals of this vast industry, you will find numerous papers and articles written on the subject of sustainability. These are to note, articles which are becoming more and more prominent and quite often the subject of sustainable water use in wine production is being questioned or under scrutiny.

Water is an essential resource to viticulture & wine making which is, in no uncertain terms both an environmental & financial cost. Throughout the world the demand for fresh water and its costs are swiftly increasing. The idea of water management practices & sustainable water use in the wine industry may be further ahead in countries with warmer climates, where these ideas have been in place for many years, often due to climatic conditions.

Through improved efficiency of water use both in the vineyard and the winery, while assessing & managing its use, water can be saved, running costs can be reduced, and social issues can not only be respected, but highlighted by the industry.

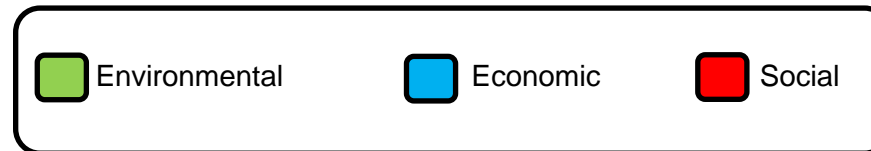
By cultivating management practices which are environmentally friendly, economically viable, and socially profitable, any wine or grape producing enterprise can begin to create a concrete framework of sustainability which will prepare it, and its industry, for the future. The aim of this toolkit is to help inform the wine industry and its members about the sustainable use of water in both the production of grapes and wine.

The information is presented in the form of a reference list, which has been gathered from different sources including publications, industry journals, government bodies, industry specialists and world-wide wine bodies and associations. The list has been created using five heading, and an explanation of what each entails can be found in the example below in figure 1. It is hoped this format will enable the information to be user friendly.

Title	Description	Information Source	Grade	Relevance to
A general title description of what the reference is about.	A slightly more in-depth analysis of what you will find through the reference, be it a paper to read, an industry supplier or a government body.	A link to find the reference via the world wide web, if available.  (Also found here is a reference for the source of the information).	Graded High, Medium or Low to help users manage the reference list in an easier manner, and arranged with the most useful at the top of the list.	The references have been labeled with the type of occupations whom may find the information most relevant to them.




**Figure 1**




To further help operators find the reference list user friendly, three coloured markers have been used throughout the list in the “Title” box, with each colour representing one of the three pillars of sustainability, as shown below in figure 2, appearing where relevant to the reference used.






**Figure 2**




**Reference List**




Title	Description	Information Source	Grade	Relevance to
Rainwater Harvesting Systems 	U.K market leader in rainwater harvesting assisting companies and households to recycle rainwater. It is a simple concept: collect rainwater, store it on site, filter and re-use instead of mains water. This aims to reduce mains water consumption, water bills & environmental impact. A key interest of the business is the education of following generations to be sustainable, and is involved in schools across the U.K	<a href="http://www.stormsaver.com">www.stormsaver.com</a>  Storm saver (2012). <i>Commercial Rainwater Harvesting</i> [Online]. <www.stormsaver.com> [Last accessed 04/06/2012].	High	Winery Owners & Managers.  Vineyard managers  Wine Bodies
Winery Wastewater Systems 	Treatment of winery wastewater by LYVE pre-engineered systems. The systems have primary, secondary & tertiary treatment options, with web-based control & monitoring. Some of the systems advantages are a small footprint, low operator input, portable and sustainable. Treated waters have several different uses, reducing mains supply and cost.	<a href="http://www.lyvesystems.com">www.lyvesystems.com</a>  LYVE Winery Wastewater Systems (2012). <i>Lyve Homepage</i> [Online]. <www.lyvesystems.com> [Last accessed 02/05/2012].	High	Winery Owners & Managers  Wine Bodies
Winery Wastewater Management & National Bodies in Australia 	CSIRO, the Commonwealth Scientific and Industrial Research Organisation, is Australia's national science agency. This part of their website details what they are doing in collaboration with Australian wineries to provide an integrated, systems approach to sustainable wastewater management. Perhaps a good example for the United Kingdom wine industry to look to.	<a href="http://www.csiro.au/science/ps2aw">www.csiro.au/science/ps2aw</a>  csiro (2012). <i>Winery wastewater management</i> [Online] < www.csiro.au> [Last accessed 26/5/2012].	High	Wine Bodies  Winery Owners & Managers  Consumers




Title	Description	Information Source	Grade	Relevance to
Winery Wastewater Update 	Article relating to California describing in good detail what winery wastewater is and why it is looked on as a problem. It details how governing bodies with regard to wastewater look to tackle and police the issue. Furthermore it outlines newer ways for wine producers to deal with their wastewater, and in doing so attempt to be more sustainable.	<a href="http://findarticles.com/p/articles/m_i_m3488/is_9_81/ai_65578651/">http://findarticles.com/p/articles/m_i_m3488/is_9_81/ai_65578651/</a>  Wensloff, G. (2000). <i>Winery wastewater update</i> [Online] <www.findarticles.com>[Last accessed 29/05/2012]	High	Wine Bodies  Winery Owners & Managers
Winery Utilities :Planning, Design & Operation 	A comprehensive look at utilities in the winery, with several chapters examining in detail the utilities and management practices to put into place to deal with winery water usage, wastewater treatment, Irrigation and reclaimed water usage, as well as other winery water aspects. Setting up properly in the first place will remove the need to fix later issues.	Publication  Storm, D.R (1997). <i>WineryUtilities :Planning,Design &amp;Operation</i> . London: Chapman & Hall.	High	Winery Owners & Managers  Winery Designers
U.K Water Efficiency 	UK's leading authority on water efficiency, providing water efficiency initiatives and research projects, water use audits & product development. Its aims are to provide water efficiency through partnership, facilitation, innovation and education. Works with government bodies to promote and implement efficiency resources.	<a href="http://www.waterwise.org.uk">www.waterwise.org.uk</a>  Water wise (2012). <i>Homepage</i> [Online]<www.waterwise.org.uk> [Last accessed 01/06/2012].	High	Winery Owners & Managers.


Title	Description	Information Source	Grade	Relevance to
Sustainability Workbook 	A workbook aimed at U.K wine producers to help them compare their own winemaking activities to the guidelines set out by Wineskills with emphasis on sustainability. Finished reports may be sent to Wineskills to receive feedback on their sustainability practices and performance.	<a href="http://www.wineskills.co.uk/sites/default/files/articles/WineSkills%20Sustainability%20Workbook%20D1.V2%20030112.pdf">www.wineskills.co.uk/sites/default/files/articles/WineSkills%20Sustainability%20Workbook%20D1.V2%20030112.pdf</a>  Plumpton College (2012). <i>Wineskills Sustainability Workbook</i> . Plumpton College Publication	High	Winery Owners & Managers  Wine Bodies
Water efficiency to save money and water 	Thames Water working in conjunction with WRAP, to help save water and cost. Offering information on efficiency and sustainable water practices which can be used in a home, business & workplace. Good information and links also available to help teach about water use, recycling & reuse and local campaigns which businesses can join to be more sustainable.	<a href="http://www.thameswater.co.uk/cps/rde/xchg/corp/hs.xsl/14253.htm">www.thameswater.co.uk/cps/rde/xchg/corp/hs.xsl/14253.htm</a>  Thames Water (2012) <i>Homepage</i> [Online]< <a href="http://www.thameswater.co.uk">www.thameswater.co.uk</a> > [Last accessed 02/06/2012]	High	Winery Owners & Managers  Vineyard Owner & Managers
Water & Money saving advice 	WRAP is a U.K sustainability practice business which is offering free advice for businesses to help identify and implement water and cost saving exercises. They are currently working with Thames Water in an effort to engage businesses in sustainable practices which it hopes will offer environmental and economic benefits.	<a href="http://www.wrap.org.uk/content/free-advice-help-businesses-save-water-and-money">www.wrap.org.uk/content/free-advice-help-businesses-save-water-and-money</a>  WRAP (2012). WRAP Homepage [Online]. < <a href="http://www.wrap.org.uk">www.wrap.org.uk</a> > [Last accessed 26/05/2012].	High	Winery Owners & Managers  Wine Bodies









Title	Description	Information Source	Grade	Relevance to
Allowances for Water Efficient Technologies 	The Enhanced Capital Allowance (ECA) scheme offers a 100 per cent first-year allowance to businesses which invest in water efficient plant or machinery. This allows for a 100% product tax write off. It aims to help businesses gain significant financial savings while helping to reduce environmental impact. The scheme is run by HM Revenue and Customs, in partnership with AEA Technology, and by the Department for Environment, Food and Rural Affairs (Defra).	<a href="http://www.businesslink.gov.uk/bdotg/action/layer?r.l1=1079068363&amp;r.lc=en&amp;r.l2=1082899409&amp;topicId=1084216413&amp;furlname=wtl&amp;furlparam=wtl&amp;ref=http%3A//www.thameswater.co.uk/cps/rde/xchg/corp/hs.xsl/9719.htm&amp;domain=www.businesslink.gov.uk">www.businesslink.gov.uk/bdotg/action/layer?r.l1=1079068363&amp;r.lc=en&amp;r.l2=1082899409&amp;topicId=1084216413&amp;furlname=wtl&amp;furlparam=wtl&amp;ref=http%3A//www.thameswater.co.uk/cps/rde/xchg/corp/hs.xsl/9719.htm&amp;domain=www.businesslink.gov.uk</a>  Business Link (2012). <i>First-year allowances for water efficient technologies</i> [Online] <www.businesslink.gov.uk> [Last accessed 01/06/2012].	High	Winery Owners & Managers.  Product manufacturers & suppliers.
Water saving products for workplace 	Information and sale of simple yet effective water saving devices which can be fitted in the work place or home. Products can be purchased directly through a link which is similar to any other online purchasing arrangement. A valuable resource which will help businesses to cut back on water use and cost.	<a href="http://www.thameswater.co.uk/cps/rde/xchg/corp/hs.xsl/9831.htm">www.thameswater.co.uk/cps/rde/xchg/corp/hs.xsl/9831.htm</a>  Thames Water (2012) <i>Homepage</i> [Online] <www.thameswater.co.uk> [last accessed 02/06/2012].	High	Winery Owners & Managers.
Water efficiency for business 	Water efficiency guidelines for business from one of the South East U.K's water supply companies. The guidelines were implemented following every increasing demands for water. Downloadable PDF format. Also on the site is information from Southern Water for water charges, waste services & water efficiency tips.	<a href="http://www.southernwater.co.uk/BusinessCustomers/waterEfficiencyForBusiness/default.asp">www.southernwater.co.uk/BusinessCustomers/waterEfficiencyForBusiness/default.asp</a>  Southern Water (2012). <i>Water efficiency for business</i> [Online] <www.southernwater.co.uk> [Last accessed 07/06/2012].	High	Winery Owners & Managers




Title	Description	Information Source	Grade	Relevance to
Winery Water Management Checklist 	A check list for water management practices and systems in wineries from the Washington Association of Grape Growers. Comprehensive and in-depth look at a management system which could be used in any winery.	<a href="http://www.wawgg.org">www.wawgg.org</a>  wawgg (2012). <i>Water management Document</i> [Online]. <www.wawgg.org> [Last accessed 31/05/2012].	High	Winery managers
UKVA Sustainability 	Sustainability policy from the U.K Vineyards Association. The policy is downloadable in a PDF format, as is a feedback summary showing opinions within the industry.	<a href="http://www.ukva.org.uk/index.php?option=com_content&amp;view=article&amp;id=79&amp;Itemid=91">www.ukva.org.uk/index.php?option=com_content&amp;view=article&amp;id=79&amp;Itemid=91</a>  UKVA (2012). <i>Sustainability</i> [Online]. <www.ukva.org.uk> [Last accessed 02/06/2012].	High	Winery owners  All winery staff  All vineyard Staff  Consumers
Water metering 	U.K company which specialises in utilities management such as water use. The company offers products which will show the customer where, when and how much water is being used. The metering systems used can be very specific, from whole premises water use right down to single operation or equipment use. Meters are used in conjunction with software which allows users to link the data direct to the laptop/computer system for monitoring and recording. A key factor in water sustainability is to know how much is used and where.	<a href="http://www.energy-monitoring-devices-performance-certificates.co.uk">www.energy-monitoring-devices-performance-certificates.co.uk</a>  Gemms (2012) <i>Homepage</i> [Online]. <www.energy-monitoring-devices-performance-certificates.co.uk> [Last accessed 10/06/2012].	High	Winery Owners & Managers  Winery staff  Consumers






Title	Description	Information Source	Grade	Relevance to
Rainwater harvesting 	Another U.K based company which specializes in rainwater harvesting. The company caters to both domestic & industrial markets, and is already working within the soft drinks industry in the U.K with Coca Cola. The website contains good reading on water sustainability and has a good news section & water sustain links page.	<a href="http://www.freerain.co.uk">www.freerain.co.uk</a>  Freerain (2012) <i>Homepage</i> [Online]. <www.freerain.co.uk> [Last accessed 10/06/2012].	High	Winery Owners & Managers  Vineyard Owner & Managers
Water Usage Monitoring 	An article on water monitoring during crop irrigation using the i-crop system. The system could be very beneficial in the South East of England, where many areas are in drought conditions. Developed by Cambridge University.	<a href="http://www.fwi.co.uk/Articles/14/01/2011/125062/Monitor-water-use-with-i-crop-system.htm">www.fwi.co.uk/Articles/14/01/2011/125062/Monitor-water-use-with-i-crop-system.htm</a>  Abram, M. (2011) <i>Monitor water use with i-crop system</i> [Online]. <www.fwi.co.uk> [Last accessed 02/06/2012].	High	Winery managers  Vineyard managers
Water Usage Monitoring 	Company specializing in water flow measurement equipment. Such equipment will enable wineries to calculate how much water they use, which is shown in water management systems as the first step in trying to reduce water usage.	<a href="http://www.rshydro.co.uk">www.rshydro.co.uk</a>  rshydro (2012) <i>Homepage</i> [Online]. <www.rshydro.co.uk> [Last accessed 05/06/2012].	High	Winery Owners & Managers

Title	Description	Information Source	Grade	Relevance to
Water & waste water Treatment 	This company believes agricultural producers should consider good water management strategic to their business as a key competitive edge, while being environmentally sound. Provides services & products within agricultural & beverage sectors to attain sustainable solutions while meeting water quality and effluent treatment requirements.	<a href="http://www.water.siemens.com">www.water.siemens.com</a>  Siemens (2012) Water and Wastewater [Online]. <www.water.siemens.com> [Last accessed 14/06/2012].	High	Winery Owners & Managers  Vineyard Owner & Managers
Water & waste water management systems 	Industry giant in water management. Website provides links and information on climate change, water management, catchment protection & organic waste recycling, showing emphasis towards sustainable practices and environment management. Working with, and links to SEDE, one of Europe's largest organic recycling companies.	<a href="http://www.veoliawater.co.uk">www.veoliawater.co.uk</a>  Veolia Water (2012) <i>Homepage</i> [Online]. <www.veoliawater.co.uk> [Last accessed 3/06/2012].	High	Winery Owners & Managers  Vineyard Owner & Managers  Wine Industry bodies
Online sustainability Resource 	As Europe's largest environmental website, Environmental Data Interactive Exchange (Eddie) is an online source of information & links for companies wishing to be responsible for their sustainability. It provides practical information with an excellent directory of products and services, updated & in-depth news, informative videos. Also provides networking and communications links & a job centre. Dedicated section for water.	<a href="http://www.edie.net">www.edie.net</a>  Edie (2012) <i>Homepage</i> [Online]. <www.edie.co.uk> [Last accessed 08/06/2012].	High	Winery Owners & Managers  Vineyard Owner & Managers  Wine Industry bodies




Title	Description	Information Source	Grade	Relevance to
Sustainability Guide to Winery water practices 	A comprehensive and in-depth guide from San Francisco which looks at sustainable water use in wineries in California. The guide, published by the Wine Institute, is aimed at self-assessment to make enhancements in environmental operation thus aiming to lower overall production costs for water. A very useful piece.	<a href="http://www.wineinstitute.org/winerywaterguide">www.wineinstitute.org/winerywaterguide</a>  Wine Institute and the American Vineyard Foundation (2008). <i>Comprehensive Guide to Sustainable Management of Winery Water and Associated Energy</i> . San Francisco: Wine Institute	High	Winery Owners & Managers  Vineyard Owner & Managers  Wine Industry Bodies
Water Management Tool 	A useful online tool for land based agricultural growers for assessment and management of water use on their land. Full access requires people to join a membership. A tool which helps people not just think about sustainable use of water, but helps put those ideas into practice. Social aspect also present on the site through consumer encouragement to be involved.	<a href="http://www.leafuk.org/leaf/farmers/watermanagementtool.eb">www.leafuk.org/leaf/farmers/watermanagementtool.eb</a>  LEAF.org (2012) <i>LEAF's Water Management Tool</i> [Online]. <www.leafuk.org> [Last accessed 14/07/2012].	High	Vineyard Owner & Managers  Consumers
Water Management Assessment & Self Checklist 	A very useful pair of documents from a Washington state online, interactive guide of business and winery management. Although it is created by and for Washington State Wineries, the documents could be used as a template for wineries worldwide to determine and assess water usage. The site is dedicated to sustainable practices and is very well detailed and informative.	<a href="http://www.wawgg.org/index.php?page_id=94">www.wawgg.org/index.php?page_id=94</a>  WAWGG.org (2012). <i>Water Management Checklist</i> . [Online]. <www.wawgg.org> [Last accessed 01/06/2012].  WAWGG.org (2012). <i>Water Management Assessment</i> . [Online]. <www.wawgg.org> [Last accessed 01/06/2012].	High	Winery Owners & Managers  Winery Staff




Title	Description	Information Source	Grade	Relevance to
Winery Wastewater Recycling 	Treating winery liquid by-products by means of two separate systems for lower & higher strength waste water. Treated water of lower strength may be reused in vineyard irrigation, while that of higher strength replaces mains water. On average it will treat 40 million litres of winery liquid waste per annum. Seen as one of the most efficient and effective waste water treatment plants in Australia. Working with several large wineries, and growing.	<a href="http://www.tarac.com.au">www.tarac.com.au</a>  Tarac technologies (2012). <i>Tarac Technologies Homepage</i> [Online]. < <a href="http://www.tarac.com.au">www.tarac.com.au</a> > [Last accessed 04/06/2012]	High	Winery Owners & Managers.  Vineyard managers  Wine Industry Bodies
Treatment of winery wastewater by a new bio-physical process 	This journal paper looks at the treatment of winery waste waters using a new bio-physical process, in order to greatly lower the organic load of such waste. It concentrates on firstly stripping out ethanol followed by concentration by evaporation. Stripping out ethanol gives a water purification rate up to 85% pre-treatment, while recovered ethanol can be sold as a biofuel.	<a href="http://www.iwaponline.com">www.iwaponline.com</a>  Colin, T., Bories, A., Sire, Y., Perrin, R. (2005) <i>Treatment and valorisation of winery waste water by a new biophysical process (ECCF)</i> . Water Science and Technology Journal, Vol 51 No.1 pp 99-106. Vienna: IWA Publishing	Medium	Winery Owners & Managers
Sustainability Practices in Wine 	Journal of Wine Research article comparing wine and food production in American north west. The paper looks at practices used in both sectors, showing more focus from wineries towards environmental sustainability, which may need to shift to include social aspects.	<a href="http://www.tandfonline.com/doi/abs/10.1080/09571264.2010.495853">www.tandfonline.com/doi/abs/10.1080/09571264.2010.495853</a>  Pullman, M.E , Maloni, M.J, Dillard, J. (2010). <i>Sustainability Practices in Food Supply Chains: How is Wine Different?</i> Journal of Wine Research, 2010, Vol. 21, No. 1, pp 35-56.	Medium	Winery Owners & Managers  Wine Industry Bodies  Consumers







Title	Description	Information Source	Grade	Relevance to
Wastewater Consultancy 	Surrey based wastewater consultancy dealing in three key aspects of water. On the wastewater side they can offer services relating to plant & pump station, Tank supply & installation, Consultancy, Water quality sampling, Environment Agency liaison.	<a href="http://www.enviro-wise.co.uk">www.enviro-wise.co.uk</a>  Envirowise (2012). Homepage [Online]<www.enviro-wise.co.uk> [Last accessed 28/05/2012].	Medium	Winery Owners & Managers.
Chilean wine brand Concha y Toro Sustainability. 	Sustainability section from the website of the Chilean producer which highlights its sustainability practices and aims. Details and information on water management among other items. The first winery in the world to calculate its water footprint.	<a href="http://www.conchaytoro.com/desarrollo_sustentable/en/manejo_agua.html">www.conchaytoro.com/desarrollo_sustentable/en/manejo_agua.html</a>  Concho y Toro (2012) Responsible water management [Online]<www.conchaytoro.com> [Last accessed 06/06/2012].	Medium	Winery Owners & Managers.  Vineyard managers  Consumers
Spanish wine brand Torres Sustainability 	Sustainability section from the website of the Spanish producer which highlights its sustainability practices and aims. Details and information on water management among other items	<a href="http://www.torres.es">www.torres.es</a>  Torres wines (2012). <i>Torres &amp; Earth</i> [Online]. <www.torres.es> [Last accessed 06/06/2012]	Medium	Winery Owners & Managers.  Vineyard managers  Consumers



Title	Description	Information Source	Grade	Relevance to
New Wastewater recycling technology 	Article relating to new technology being used in a Californian winery which can recycle up to 90% of the winery waste water, while retaining heat in the water. Research carried out in conjunction with University of California at Davis.	<a href="http://cleantechnica.com/2010/01/06/new-recycling-technology-turns-winery-into-water-saver/">http://cleantechnica.com/2010/01/06/new-recycling-technology-turns-winery-into-water-saver/</a>  Clean Technia (2012). <i>New technology turns winery into water saver</i> [Online]. <www.cleantechnica.com> [Last accessed 05/06/2012].	Medium	Winery Owners & Managers
Environmental Protection Authority (EPA) guidelines  	Australian EPA guidelines for wastewater monitoring programs. Very in-depth, to a scientific level, yet very informative with regard to practices.	<a href="http://www.apal.com.au/site/DefaultSite/filesystem/documents/artilces%20and%20papers/EPAguidelines.pdf">www.apal.com.au/site/DefaultSite/filesystem/documents/artilces%20and%20papers/EPAguidelines.pdf</a>  EPA (2004). <i>Water management guidelines</i> [Online] <www.apal.com.au> [Last accessed 03/06/2012].	Medium	Winery Owners & Managers
Vineyard Water Usage Guidelines  	Australian guidelines to vineyard management practices. In-depth and critical look at water use in the vineyard which may be more useful to U.K vineyards than first thought, especially now with unlikely U.K seasonal weather conditions, causing drier winters and warmer spring/summers.	<a href="http://www.crcv.com.au/resources/Environment/Good%20Environment%20Management%20Guidelines/%20282%29%20GEM%20Guidelines%20Vineyard%20Water%20Use%20Management.pdf">www.crcv.com.au/resources/Environment/Good%20Environment%20Management%20Guidelines/%20282%29%20GEM%20Guidelines%20Vineyard%20Water%20Use%20Management.pdf</a>  Cooperative Research Centre for Viticulture (2005). <i>GEM Guidelines: Vineyard Water Use Management</i> [Online]. <www.crcv.com.au> [Last accessed 30/05/2012].	Medium	Vineyard managers



Title	Description	Information Source	Grade	Relevance to
Monitoring water usage to reduce costs 	Scottish Government website aimed at businesses to reduce water usage by monitoring. Basic outlines of a plan to use. Useful links to allowances for water efficient technologies. In conjunction with DEFRA.	<a href="http://www.business.scotland.gov.uk/bdotg/action/detail?itemId=1082908269&amp;site=202&amp;type=RESOURCES">www.business.scotland.gov.uk/bdotg/action/detail?itemId=1082908269&amp;site=202&amp;type=RESOURCES</a>  Business gateway (2012) <i>Monitor your water use</i> [Online]. <www.business.scotland.gov.uk> [Last accessed 07/06/2012].	Medium	Winery Owners & Managers
Water management 	Dutch based company which deals in all water areas, from potable water production to the treatment of process and wastewater. Limited website data, but with links to U.K based agents. It also has a branch working in wine filtration.	<a href="http://www.x-flow.com">www.x-flow.com</a>  X-Flow BV (2012) <i>Homepage</i> [Online]. <www.x-flow.co.uk> [Last accessed 11/06/2012].	Medium	Winery Owners & Managers
Waste water Guidelines for South African wineries 	South African publication article which focuses on guidelines which should be developed in a winery to create a wastewater management and solids waste plan. The article shows how wineries can work with governing bodies in South Africa to ensure the treat wastewater correctly and responsibly. It also shows how these plans help protect the environment and while cost saving.	<a href="http://www.wynboer.co.za/recentarticles/0304water.php3">www.wynboer.co.za/recentarticles/0304water.php3</a>  Van Schoor, L., Rossouw, J. (2001) <i>Guidelines For a Winery Wastewater and Solid Waste Management Plan</i> [Online]. <www.wynboer.co.za> [Last accessed 21-05-2012].	Medium	Winery Owners & Managers

Title	Description	Information Source	Grade	Relevance to
Recycling winery wastewater for vineyard irrigation 	A recent paper from Australia which looks at the use of treated and recycled winery wastewater for use as irrigation water in the vineyard. It talks about the balance of using such water in a sustainable manner against the health of soil and the vines, as there may be a loading of both sodium and potassium in recycled waters. The practice is gaining ground as water sustainability becomes a bigger issue.	Journal Article (May incur cost to retrieve full article)  Laurenson,S.,Bolan, N.S., Smith, E., McCarthy, M. (2012) <i>Review: Use of recycled wastewater for irrigating grapevines</i> . Australian Journal of Grape and Wine Research 18, 1–10	Medium	Winery Owners & Managers  Vineyard Owner & Managers  Wine Industry Bodies
Water management at wineries in Crete 	An in depth paper from Greece looking at using recycled water for reuse in wineries and for irrigation in the vineyard. The paper attempts to cover all three aspects of sustainability and show how proper water management in the industry can have a positive effect on environmental, economic & social issues in winemaking.	Journal Article (May incur cost to retrieve full article)  Tsagarakis,K.P., Dialynas G.E, Angelakis, A.N (2004). <i>Water resources management in Crete (Greece)including water recycling and reuse and proposed quality criteria</i> . Agricultural Water Management 66 (2004) 35–47.	Medium	Winery Owners & Managers  Winery Staff
Winery wastewater treatment 	A paper from Italy which looks into newer technology for treating winery waste waters, which due to a much lower footprint coupled with a high level of results, would appear to be more sustainable than more traditional methods of treatment and recycling. An interesting read but more research is required.	Journal Article (May incur cost to retrieve full article)  Guglielmi, G., Andreottola, G., Foladori, P., Ziglio, G. (2009). <i>Membrane bioreactors for winery wastewater treatment:case-studies at full scale</i> . Water Science & Technology 60.5, 2009, pp1201-1207	Medium	Winery Owners & Managers  Winery Staff

Title	Description	Information Source	Grade	Relevance to
Winery wastewater carbon footprint  	A journal paper which discusses the carbon footprint of treating winery wastewater and how it directly affects wine regions. It gives an idea as to how the overall carbon footprint of the treatment process could be significantly reduced through more efficient processing and conservation of energy, which would be sustainably agreeable.	Journal Article (May incur cost to retrieve full article)  Rosso D., Bolzonella, D. (2009) <i>Carbon footprint of aerobic biological treatment of winery wastewater</i> . Water Science & Technology 60.5, 2009, pp1185-1189	Low	Winery Owners & Managers  Vineyard Owner & Managers  Wine Industry Bodies
Winery wastewater treatment  	A journal article from Portugal which looks at the treatment of winery wastewaters for reuse in vineyard irrigation. The study aims to help establish plans for efficient water use. In sustainable terms this could increase the preservation of the water resource, which in turn would reduce the production of wastewaters.	Journal Article (May incur cost to retrieve full article)  Oliveira, M., Queda, C., Duarte, E. (2009) <i>Aerobic treatment of winery wastewater with the aim of water reuse</i> . Water Science & Technology, 60.5, 2009, pp1217-1223	Low	Winery Owners & Managers  Winery Staff
Treatment of high strength winery wastewater  	A paper looking at Californian winery waste water, which attempts to classify it by strength, By looking at winery wastewater throughout different times of the year. It also looks into a new system of treatment which outlines the use of a constructed wetland onsite.	<a href="http://www.jstor.org/discover/10.2307/25045514?uid=3738032&amp;uid=2&amp;uid=4&amp;sid=56241321113">www.jstor.org/discover/10.2307/25045514?uid=3738032&amp;uid=2&amp;uid=4&amp;sid=56241321113</a>  Shepard, H.L, Grismer, M.E, Tchobanoglous, G. (2001). <i>Treatment of high strength winery wastewater using a subsurface-flow constructed wetland</i> [Online]. <www.jstor.org> [Last accessed 02/05/2012].	Low	Wine Industry Bodies  Winery Owners & Managers  Environmental Bodies  Consumers

Title	Description	Information Source	Grade	Relevance to
Water Footprint of Food 	An interesting paper from the Netherlands discussing the water footprint of manufacturing different food groups, which attempts to make the reader realize the cost in water for production of such items. It shows how a water footprint can be broken down, in order to reduce water usage through different options.	<a href="http://www.waterfootprint.org/Reports/Hoekstra-2008-WaterfootprintFood.pdf">www.waterfootprint.org/Reports/Hoekstra-2008-WaterfootprintFood.pdf</a>  Hoekstra, A.Y (2008). <i>The Water Footprint of Food</i> [Online]. <www.waterfootprint.org> [Last accessed 05/06/2012].	Low	Winery Owners & Managers  Vineyard Owner & Managers  Consumers
Water shortages in California's wine producing region 	A brief video from IBM showing how it is helping the Sonoma County Water Agency of California to help manage its water systems in the northern part of the state where wine production is mainly carried out. It displays not just the environmental issue of water sustainability but also the social aspect of it, with a corporation giant like IBM getting involved with ensuring such a vast area & population has a sufficient water supply.	<a href="http://www-03.ibm.com/press/us/en/pressrelease/31995.wss">http://www-03.ibm.com/press/us/en/pressrelease/31995.wss</a>  IBM (2012). <i>IBM Newsroom</i> [Online]. < http://www-03.ibm.com/press> [Last accessed 28/05/2012].	Low	Winery Owners & Managers  Wine Industry Bodies  Consumers  Social Sponsors

**References:**

Abram, M. (2011) *Monitor water use with i-crop system* [Online]. <[www.fwi.co.uk](http://www.fwi.co.uk)> [Last accessed 02/06/2012].

Business gateway (2012) *Monitor your water use* [Online]. <[www.business.scotland.gov.uk](http://www.business.scotland.gov.uk)> [Last accessed 07/06/2012].

Business Link (2012). *First-year allowances for water efficient technologies*[Online]<[www.businesslink.gov.uk](http://www.businesslink.gov.uk)> [Last accessed 01/06/2012].

Clean Technia (2012). *New technology turns winery into water saver* [Online].<[www.cleantechnica.com](http://www.cleantechnica.com)> [Last accessed 05/06/2012].

Colin, T., Bories, A., Sire, Y., Perrin, R. (2005) *Treatment and valorisation of winery waste water by a new biophysical process (ECCF)*. Water Science and Technology Journal, Vol 51 No.1 pp 99-106. Vienna: IWA Publishing

Concho y Toro (2012) *Responsible water management* [Online]<[www.conchaytoro.com](http://www.conchaytoro.com)> [Last accessed 06/06/2012].

Cooperative Research Centre for Viticulture (2005). *GEM Guidelines: Vineyard Water Use Management* [Online]. < [ww.crcv.com.au](http://www.crcv.com.au)> [Last accessed 30/05/2012].

csiro (2012). *Winery wastewater management* [Online] < [www.csiro.au](http://www.csiro.au)> [Last accessed 26/5/2012].

Edie (2012) *Homepage* [Online]. <[www.edie.co.uk](http://www.edie.co.uk)> [Last accessed 08/06/2012].

Envirowise (2012). *Homepage* [Online]<[www.enviro-wise.co.uk](http://www.enviro-wise.co.uk)> [Last accessed 28/05/2012].

EPA (2004). *Water management guidelines* [Online] <[www.apal.com.au](http://www.apal.com.au)> [Last accessed 03/06/2012].

Freerain (2012) *Homepage* [Online]. <[www.freerain.co.uk](http://www.freerain.co.uk)> [Last accessed 10/06/2012].

Gemms (2012) *Homepage* [Online]. <[www.energy-monitoring-devices-performance-certificates.co.uk](http://www.energy-monitoring-devices-performance-certificates.co.uk)> [Last accessed 10/06/2012].

Guglielmi, G., Andreottola, G., Foladori, P., Ziglio, G. (2009). *Membrane bioreactors for winery wastewater treatment: case-studies at full scale*. *Water Science & Technology* 60.5, 2009, pp1201-1207

Hoekstra, A.Y (2008). *The Water Footprint of Food* [Online]. <[www.waterfootprint.org](http://www.waterfootprint.org)> [Last accessed 05/06/2012].

IBM (2012). *IBM Newsroom* [Online]. <<http://www-03.ibm.com/press>> [Last accessed 28/05/2012].

Laurenson, S., Bolan, N.S., Smith, E., McCarthy, M. (2012) *Review: Use of recycled wastewater for irrigating grapevines*. *Australian Journal of Grape and Wine Research* 18, 1–10

LEAF.org (2012) *LEAF's Water Management Tool* [Online]. <[www.leafuk.org](http://www.leafuk.org)> [Last accessed 14/07/2012].

LYVE Winery Wastewater Systems (2012). *Lyve Homepage* [Online]. <[www.lyvesystems.com](http://www.lyvesystems.com)> [Last accessed 02/05/2012].

Oliveira, M., Queda, C., Duarte, E. (2009) *Aerobic treatment of winery wastewater with the aim of water reuse*. *Water Science & Technology*, 60.5, 2009, pp1217-1223

Plumpton College (2012). *Wineskills Sustainability Workbook*. Sussex: Plumpton College Publication

Pullman, M.E , Maloni, M.J, Dillard, J. (2010). *Sustainability Practices in Food Supply Chains: How is Wine Different?* Journal of Wine Research, 2010, Vol. 21, No. 1,pp 35-56.

Rosso D., Bolzonella, D. (2009) *Carbon footprint of aerobic biological treatment of winery wastewater*. Water Science & Technology 60.5, 2009, pp1185-1189

Rshydro (2012) *Homepage* [Online]. <[www.rshydro.co.uk](http://www.rshydro.co.uk)> [Last accessed 05/06/2012].

Shepard, H.L, Grismer, M.E, Tchobanoglous, G. (2001). *Treatment of high strength winery wastewater using a subsurface-flow constructed wetland* [Online]. <[www.jstor.org](http://www.jstor.org)> [Last accessed 02/05/2012].

Siemens (2012) *Water and Wastewater* [Online]. <[www.water.siemens.com](http://www.water.siemens.com)> [Last accessed 14/06/2012].

Southern Water (2012). *Water efficiency for business* [Online] <[www.southernwater.co.uk](http://www.southernwater.co.uk)> [Last accessed 07/06/2012].

Storm, D.R (1997). *WineryUtilities :Planning,Design &Operation*. London: Chapman & Hall.

Storm saver (2012). *Commercial Rainwater Harvesting* [Online]. <[www.stormsaver.com](http://www.stormsaver.com)> [Last accessed 04/06/2012].

Tarac technologies (2012). *Tarac Technologies Homepage* [Online]. <[www.tarac.com.au](http://www.tarac.com.au)> [Last accessed 04/06/2012]

Thames Water (2012) *Homepage* [Online]<[www.thameswater.co.uk](http://www.thameswater.co.uk)> [last accessed 02/06/2012].

Torres wines (2012). *Torres & Earth* [Online]. <[www.torres.es](http://www.torres.es)> [Last accessed 06/06/2012]

Tsagarakis,K.P., Dialynas G.E, Angelakis, A.N (2004). *Water resources management in Crete (Greece)including water recycling and reuse and proposed quality criteria*. *Agricultural Water Management* 66 (2004) 35–47.

Van Schoor, L.,Rossouw, J.(2001) *Guidelines For a Winery Wastewater and Solid Waste Management Plan* [Online]. <[www.wynboer.co.za](http://www.wynboer.co.za)> [Last accessed 21-05-2012].

UKVA (2012). *Sustainability* [Online]. <[www.ukva.org.uk](http://www.ukva.org.uk)> [Last accessed 02/06/2012].

Veolia Water (2012) *Homepage* [Online]. <[www.veoliawater.co.uk](http://www.veoliawater.co.uk)> [Last accessed 3/06/2012].

Water wise (2012). *Homepage* [Online]<[www.waterwise.org.uk](http://www.waterwise.org.uk)> [Last accessed 01/06/2012].

Wawgg (2012). *Water management Document* [Online]. <[www.wawgg.org](http://www.wawgg.org)> [Last accessed 31/05/2012].

WAWGG.org (2012). *Water Management Assessment*. [Online]. <[www.wawgg.org](http://www.wawgg.org)> [Last accessed 01/06/2012].

WAWGG.org (2012). *Water Management Checklist*. [Online]. <[www.wawgg.org](http://www.wawgg.org)> [Last accessed 01/06/2012].

Wensloff, G. (2000). *Winery wastewater update* [Online] <[www.findarticles.com](http://www.findarticles.com)>[Last accessed 29/05/2012]



Wine Institute and the American Vineyard Foundation (2008). *Comprehensive Guide to Sustainable Management of Winery Water and Associated Energy*. San Francisco: Wine Institute

WRAP (2012). WRAP Homepage [Online]. <[www.wrap.org.uk](http://www.wrap.org.uk)> [Last accessed 26/05/2012].

X-Flow BV (2012) *Homepage* [Online]. <[www.x-flow.co.uk](http://www.x-flow.co.uk)> [Last accessed 11/06/2012].