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The Role of Floating Solar Systems in the Energy-Land Use Nexus: A Case Study on the Potential for South African Wineries

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Introduction

In the year 2008, the European Union for example introduced a plan to pay farmers a subsidy to uproot their grapes (European Commission, 2008). The main thrust was withdraw around 175,000 hectares of vineyards from wine production in order to reduce oversupply, reduce production of uncompetitive wines, and compensate producers by offering alternatives. At the same time, the EU was offering attractive solar energy subsidies, resulting in wine farmers uprooting vineyards in exchange for solar power plant installations (Forum, 2009).

International developments

Pioneering work of the Far Niente winery in the USA Napa Valley who installed the world's first so-called Floatovoltaic system. This over-water grid-connected pontoon floating solar renewable energy installation was installed over the irrigation dam of the farm, where it is surrounded by the vineyards. It saved the owners considerable losses, for there was no need to uproot valuable historic vineyards to create land scape for the installation of a solar power system, as was done with the vineyards in many other countries before (Pentland, 2011). In order for the solar system to provide sufficient power to the winery, the size of the installation requires significant land. If located in the vineyard, a large amount of the grape growing land would be lost to the photovoltaic array.

Fig. 1. Floating solar at Far Niente, USA Napa Valley (Trapani and Santafe, 2014)

Solar renewable energy

As renewable energies such as solar energy are gaining popularity in the wine making industry (Smyth, 2011). Emerging technology concepts such as solar farms have taken on a new meaning after the advent of the floating solar photovoltaic system (Sahu, 2015). A floating solar farm integrates existing land based type photovoltaic technology with the newly developed pontoon floating photovoltaic technology.

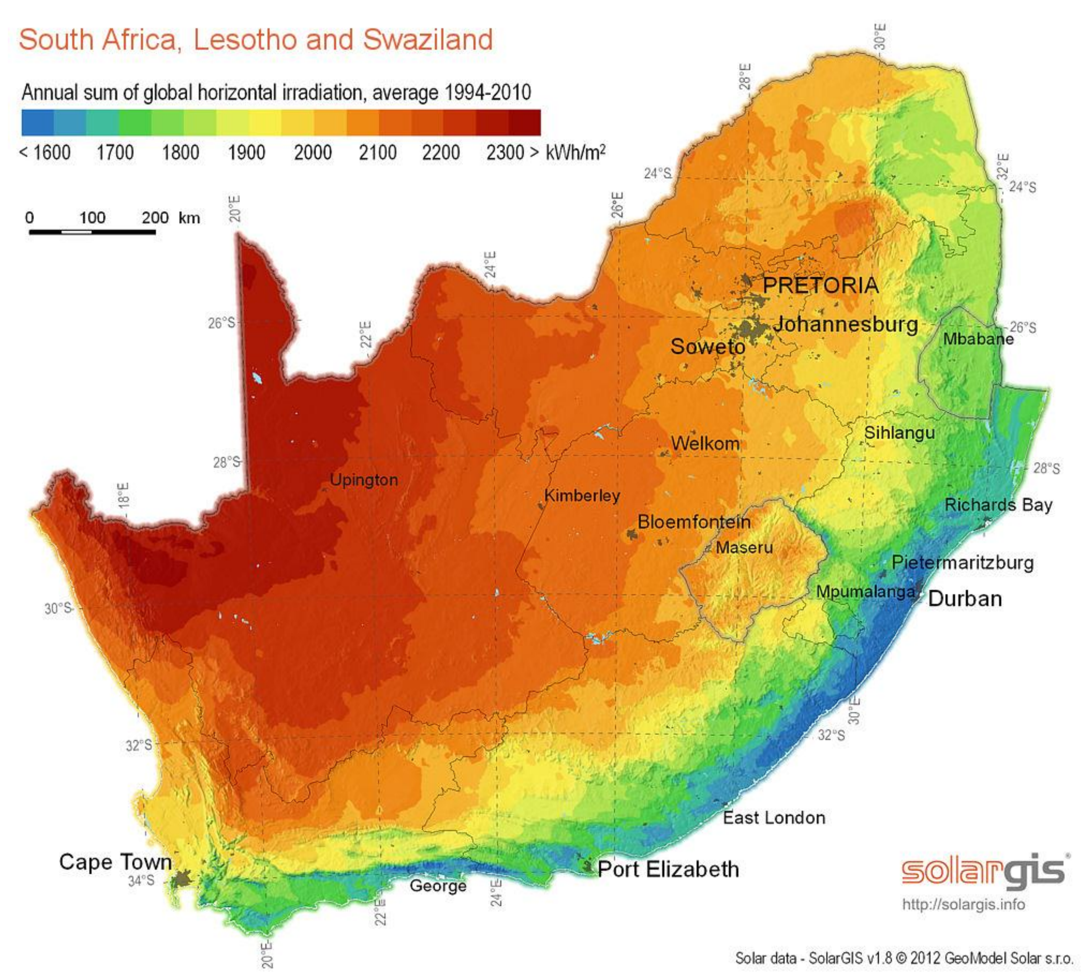

Fig. 2. Solar atlas for South Africa (SolarGIS, 2015)

The arable-land-conserving answer is to physically locate the solar array in winery's irrigation pond. A tracking concentrated solar system as shown in Fig 3, has the added advantage that waste heat can be recovered from the solar system in order to make hot water that can be used in the winery.

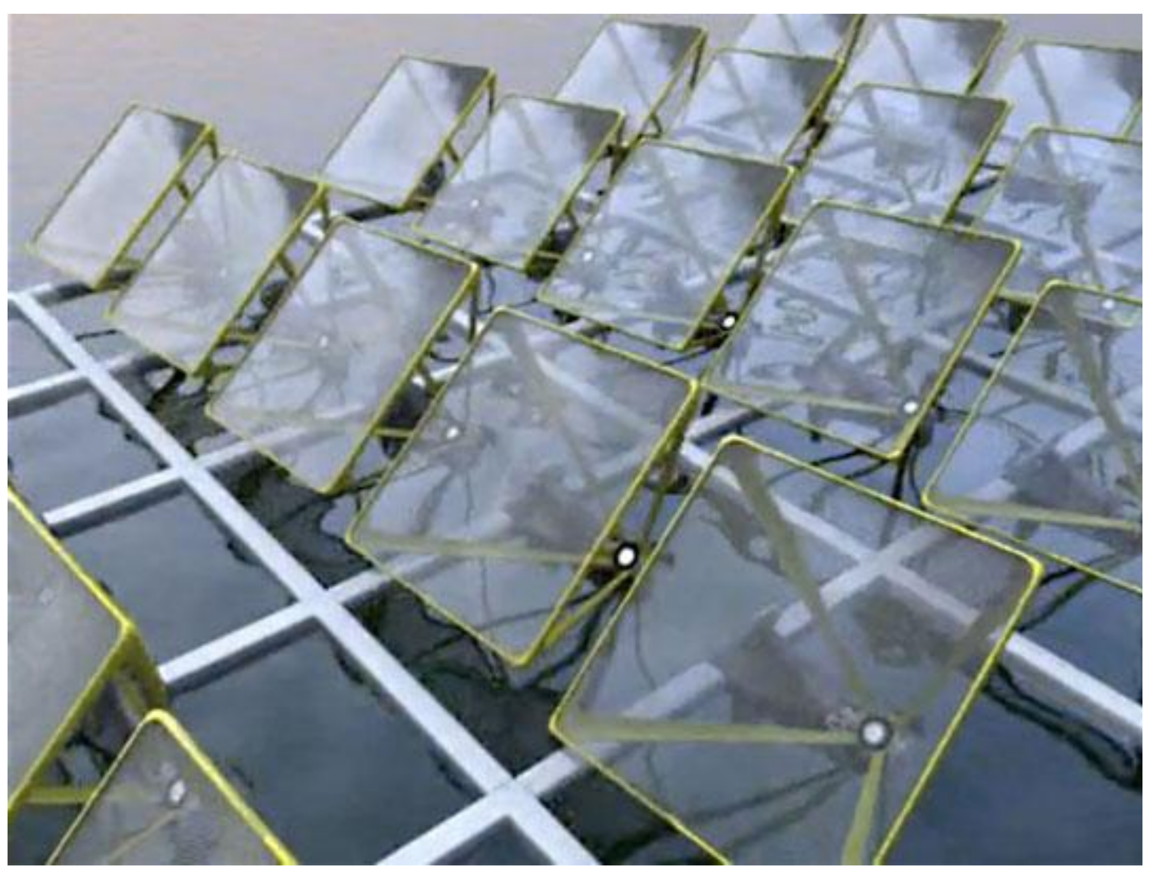

Fig. 3. Concentrated Solar floating solar system (Sunengy, 2015)

Water, energy, land, food nexus

The water, energy, land and food (WELF) nexus concept is a valuable tool to study viticulture and oenology sustainability scenarios in terms of food production, land-, energy- and water-resource interactions and optimization (Ringler, 2013). It is proposed in this study that such nexus parameters further be used in the geographical evaluation of floating solar energy and space optimization opportunities in environmental management plans for local wine farms in the Western Cape wine region. This concept further promotes environmental and economical sustainability, by effectively using the limited space on the wine farm and ensuring the productivity of land space which vineyards need.

Summary

Floating solar renewable energy technology provide access to a cost-effective, secure and environmentally sustainable supply of energy. Their rapid growth can have substantial spill-over effects in the water and food sectors. Yet detailed knowledge on the role renewable energy can play in the nexus remains limited and widely dispersed. Renewable Energy in the Water, Energy and Food Nexus aims to bridge this gap, providing the broad analysis that has been lacking on the interactions of renewable energy within those key sectors. Global and country-specific cases to highlight how renewable energy can address the trade-off's, helping to address the world's pressing water, energy and food challenges (IRENA, 2015).

Floating solar PV panels provide electrical power without harming or causing damage to the nature by directly transforming the suns energy into electricity (Singh, 2013). These adaptation methods not only reduce the carbon footprint, increase water preservation, help with algal growth control, and thus ensure more sustainable development of the wineries.

References

- European Commission (2008). Reform of the EU wine market. European Commission, Agriculture and Rural Development: Adopted by the Council of Ministers in April 2008, EC Regulation 479/2008 and 555/2008, pp. 12.
- IRENA (2015). Renewable energy in the water, energy and food nexus. International Renewable Energy Agency, , no. January, pp. 1125.
- Pentland, W. (2011). Napa Winery Pioneers Solar Floatovoltaics. Forbes Business, no. August, pp. 13.
- Trapani, K. and Santafe, M. (2014). A review of floating photovoltaic installations: 2007-2013. Progress in Photovoltaics: Research and Applications, Wiley Publications, vol. 23, no. 4, pp. 524532. ISSN 10627995.
- Ringler, C., Bhaduri, A. and Lawford, R. (2013 December). The nexus across water, energy, land and food (WELF): potential for improved resource use efficiency? Current Opinion in Environmental Sustainability, vol. 5, no. 6, pp. 1877-3435.
- Sahu, Y., Shahabuddin, M. and Agrawal, P. (2015). Floating solar photovoltaic system an emerging technology. National Seminar on Prospects and challenges of electrical Power Industry in India, pp. 219227.
- Singh, G. (2013). Solar power generation by PV (photovoltaic) technology: A review. Review Article Energy, vol. 53, pp. 113.
- Smyth, M., Russell, J. and Milanowski, T. (2011). Solar Energy in the Winemaking Industry. London: Springer-Verlag.
- SolarGIS (2012). SolarGIS Database version 1.8 satellite-derived solar radiation and meteorological data. GeoModel Solar, pp. 112.
- Sunengy. (2015). Tracking solar Concentrated Photovoltaic (CPV) technology. Available from http://sunengy.com/about/.
- World Economic Forum (2009). Green Investing: Reducing the Cost of Financing. World Economic Forum, , no. January, pp. 156.