Salt Partners

European salt and chloralkali industry – recent trends and outlook

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Roskill Salt 2017 Conference, 28.- 29.3.2017, Hotel Renaissance Dusseldorf, Germany

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Salt Production World-wide

Salt type	World production
Solar salt	120,000,000 t/y
Rock salt	80,000,000 t/y
Brines	100,000,000 t/y
Total	300,000,000 t/y

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Salt Consumption World-wide

Salt user	Salt consumption
Chemical industry	180,000,000 t/y
Food	30,000,000 t/y
De-icing	40,000,000 t/y
Other	50,000,000 t/y
Total	300,000,000 t/y

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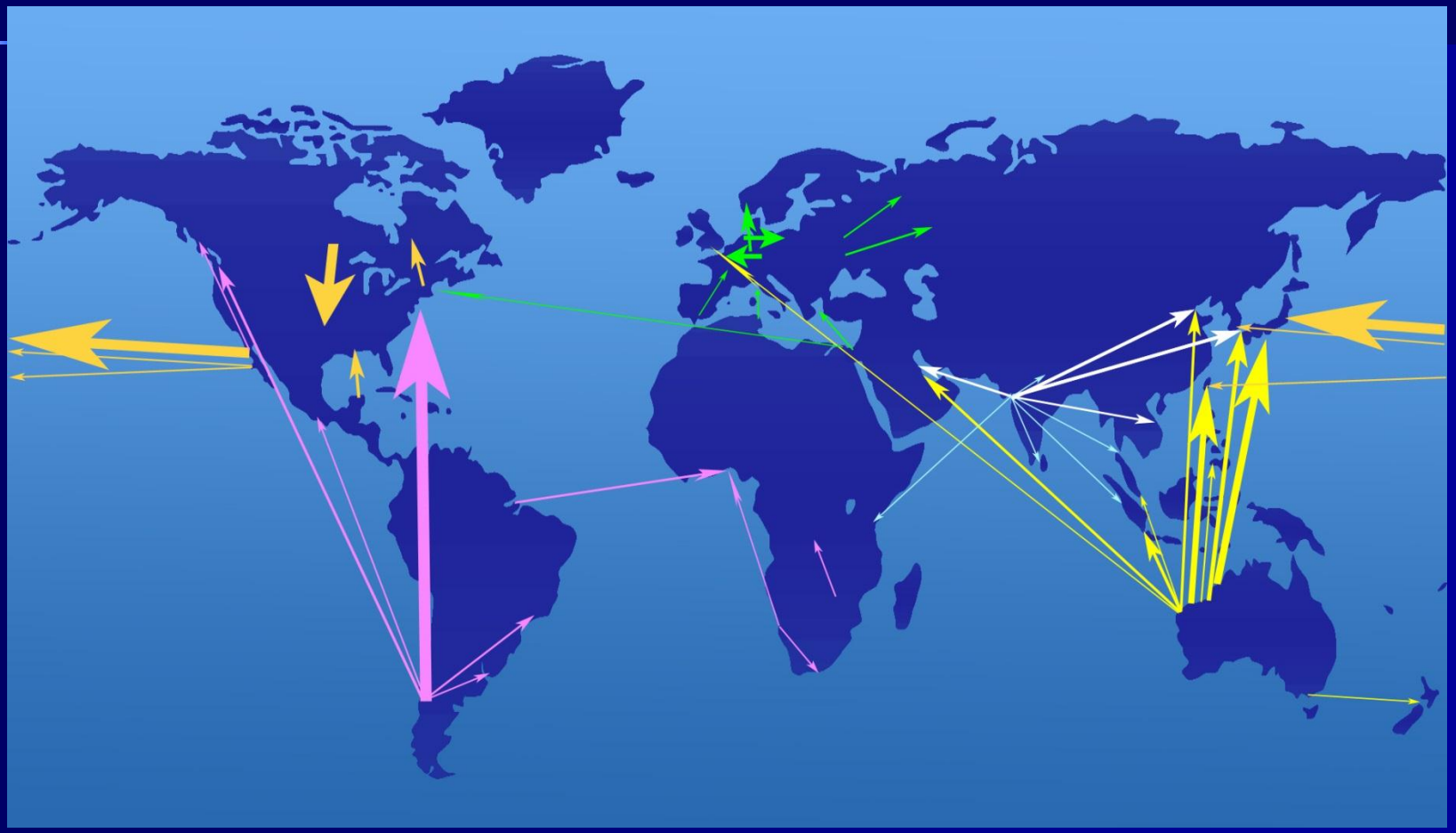
World Bulk Salt Trade



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Flight over Australian Saltfields

In 2009 Salt Partners flew over some of the world largest solar saltfields. Isabella Sedivy was shooting pictures.

GOOGLE EARTH

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Shark Bay Salt Stockpiles

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The Shark Bay stockpiles are 200m long and 60m wide. Their design capacity is 250’000 t. In 2009 they were less than half full.

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Shark Bay Salt Stockpiles

In November 2016, viewed on Google Earth, the Shark Bay stockpiles were still less than half full.

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Lake McLeod Salt Stockpile

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At Lake McLeod, the stockpile next to the wash plant has a design capacity of 1’500’000 t. In 2009 it was about 12% full.

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Lake McLeod Salt Stockpile

Also the Lake McLeod stockpile pictured in 2016 didn't show much change.

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Onslow Salt Stockpile

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Onslow stockpile was designed for 500‘000 t of salt. On 2.2.2009, there was virtually no salt left. The picture shows the shipment of last salt from Onslow stockpile.

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Onslow Brine Pond No. 1

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Onslow brine pond one week after it was hit by the cyclone Dominic. The dikes were broken through at three locations. Brine was flowing out, to the sea. It took many months to restore full production.

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Onslow Salt Stockpile

This Google Earth image from May 2016 shows Onslow stockpile about 25% full.

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Dampier Original Drying Stockpile

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At Dampier, the original drying stockpile was designed for up to 2’000’000 t. It is not being used any more. Harvested salt is hauled to the new washing plant near the sea shore.

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Dampier Original Intermediate Stockpile

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The two Dampier original intermediate stockpiles are now used to dry the salt washed in a new washing plant. They are 400 m long and 55 m wide. They can hold up to 500’000 t. In 2009 the pictured stock was estimated at about 170’000 t or 36% of design capacity.

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Dampier Original Intermediate Stockpile

The Google Earth image from late 2016 shows Dampier intermediate stockpile almost empty.

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Dampier Shipping Stockpile

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Dampier shipping stockpile could hold more than 250’000 t. The picture from 2009 shows less than100’000 t of salt ready for shipment.

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Dampier Shipping Stockpile

This Google Earth image from May 2016 shows unchanged situation at the Dampier salt shipping stockpile.

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Port Headland Stockpiles

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Port Headland stockpiles are large enough to hold about 1’400’000 t. In February 2009, they were less than 60% full.

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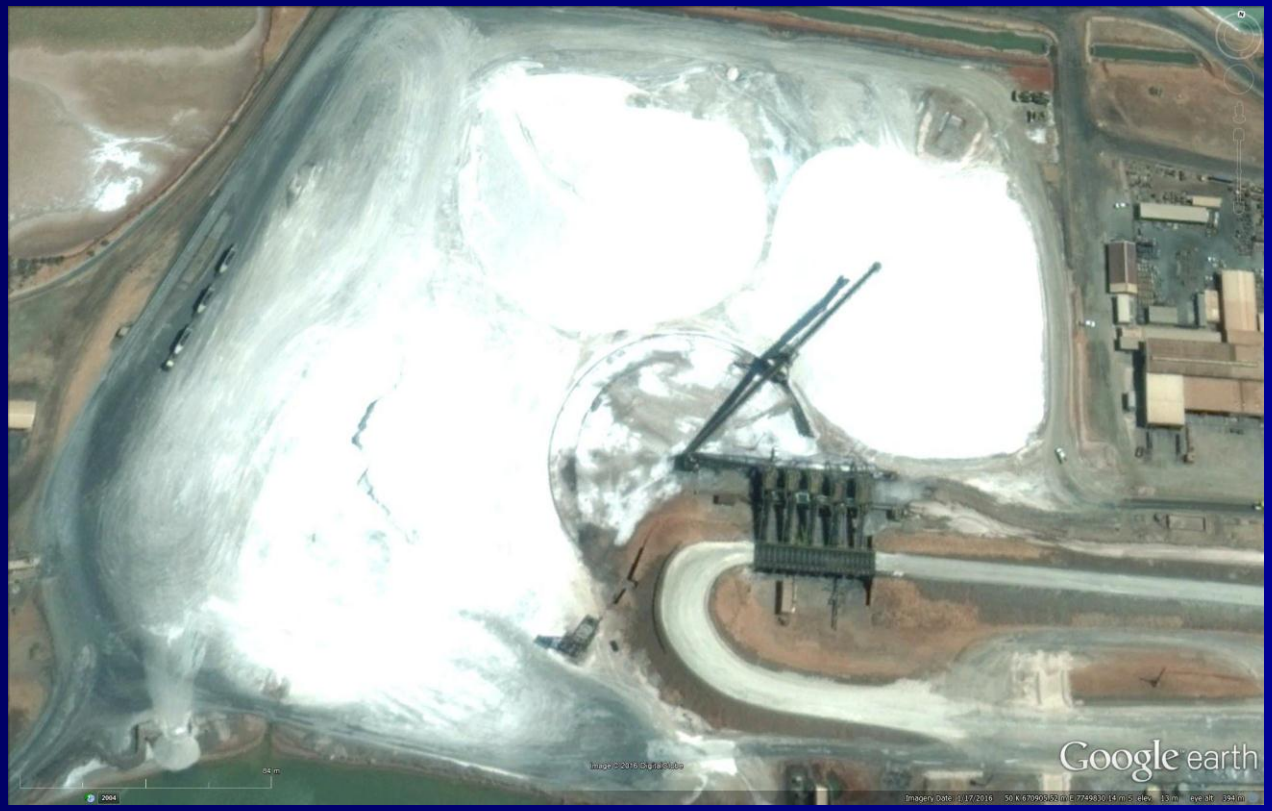
Port Headland Stockpiles



This Google Earth image from January 2016 shows Port Headland stockpile to be about 40% full.

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Australian Salt Stockpiles in February 2009

Salt Producer	Stockpile	Stockpile Capacity	Salt on Stock	Percent Full
		(t)	(t)	(%)
Shark Bay		275‘000	133‘000	48%
Onslow		652‘000	1‘000	0%
McLeod	Drying	1'520‘000	180‘000	12%
	Shipping	267‘000	7‘000	3%
Dampier	Drying	1'896‘000	0	0%
	Intermediate	475‘000	169‘000	36%
	Shipping	264‘000	96‘000	36%
Port Headland	Drying	999‘000	567‘000	57%
	Shipping	384‘000	199‘000	52%
Total		**6'732‘000**	**1'352'000**	**20%**

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Australian Salt Production Capacity and Design Stockpiling Capacity

Salt Producer	Production Capacity	Stockpiling Capacity	Percent
	(t/y)	(t)	(%)
Shark Bay	2’200’000	275’000	13%
Onslow	2’500’000	653’000	26%
McLeod	2’300’000	1’787’000	78%
Dampier	4’000’000	2’635’000	66%
Port Headland	3’500’000	1’384’000	40%
Total	**14’500’000**	**6’734’000**	**46%**

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Australian Salt Production Capacity and Salt on Stockpile

Salt Producer	Production Capacity	Salt on Stockpile	Percent
	(t/y)	(t)	(%)
Shark Bay	2’200’000	133’000	6%
Onslow	2’500’000	1’000	0%
McLeod	2’300’000	187’000	8%
Dampier	4’000’000	264’000	7%
Port Headland	3’500’000	765’000	2%
Total	**14’500’000**	**1’352’000**	**9%**

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World Salt Production 2006 - 2015

Continent	Production in 2006	Production in 2015	Total change	Annual Change
	(t/y)	(t/y)	(%)	(%)
Asia	86’563’000	105’084’000	21	2.2
Europe	83’636’000	72’896’000	-13	- 1.5
North American FTA	67’228’000	71’267’000	6	0.7
Latin America	17’289’000	25’881’000	50	4.6
Oceania	11’447’000	13’565’000	19	1.9
Africa	4’691’000	6’169’000	189	12.5
Total	**266’162’000**	**288’693’000**	**8.5**	**0.9**

Sources: Roskill, BGS, USGS and national sources

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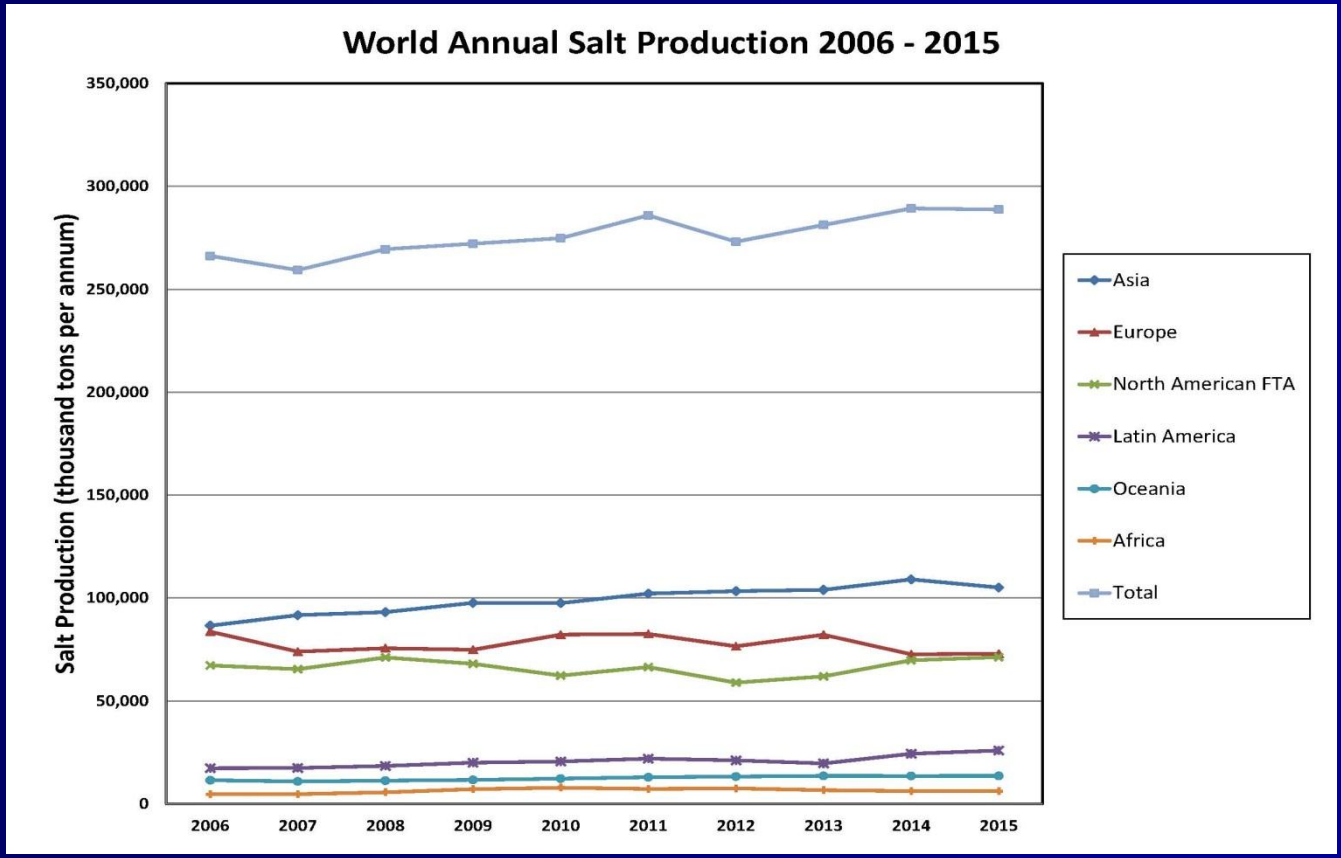
World Salt Production 2006 - 2015



Since 2006, world salt production has risen by 22.5 million tonnes, equal to 8.5%, or equal to 0.9% per annum. Most of the growth comes from Asia (18.5Mt), followed by Africa (8.9Mt) and Latin America (8.6Mt). Salt production in Europe has fallen by 10.7 million tonnes in the past 10 years.

Sources: Roskill, BGS, USGS and national sources

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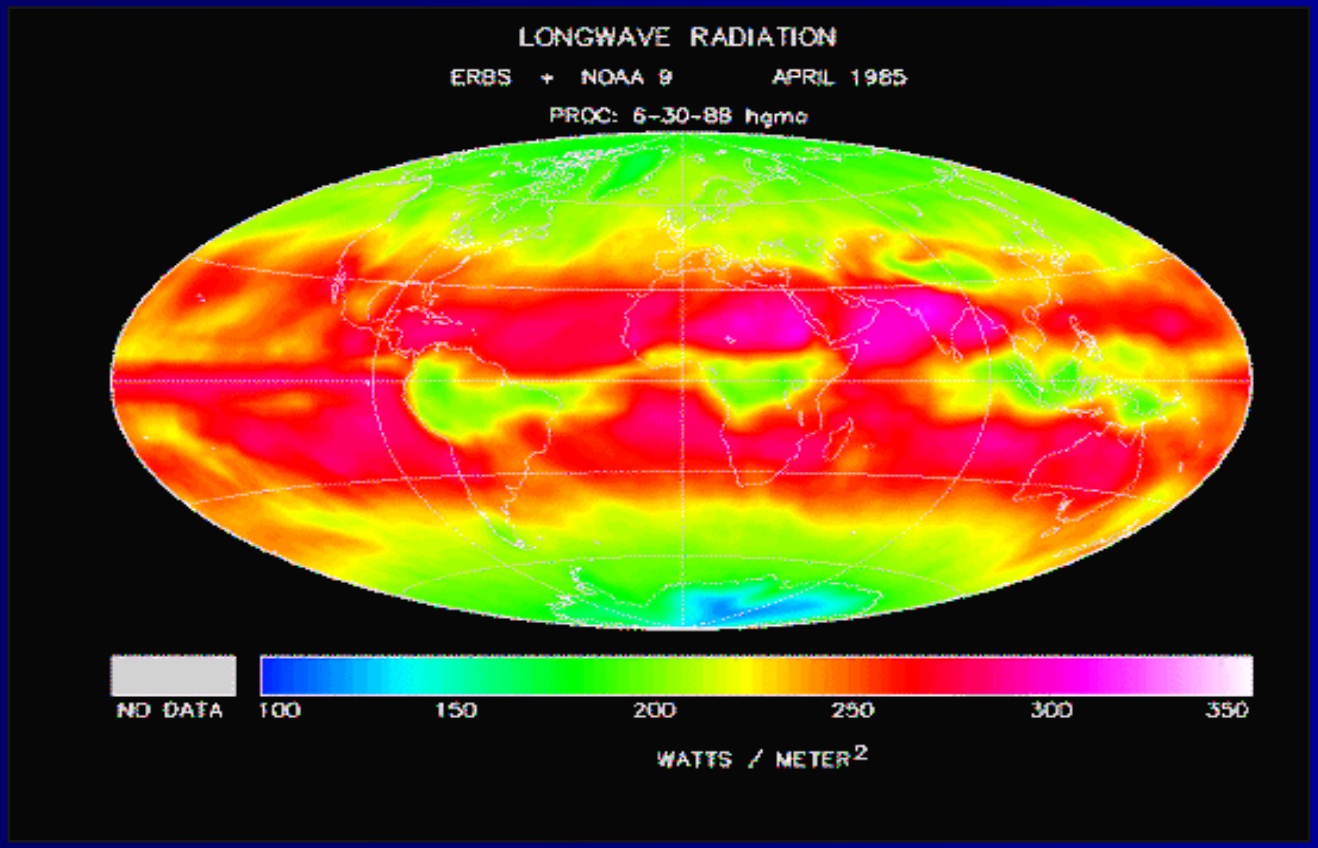
Solar Energy on the Planet Earth



NASA

Locations with highest rates of evaporation, suitable for solar salt production:

Caribbean Sea
North Africa
South Africa
Middle East
Western India
Western Australia

In China, the Gulf of Bohai receives only half the solar energy available at the most suitable locations.

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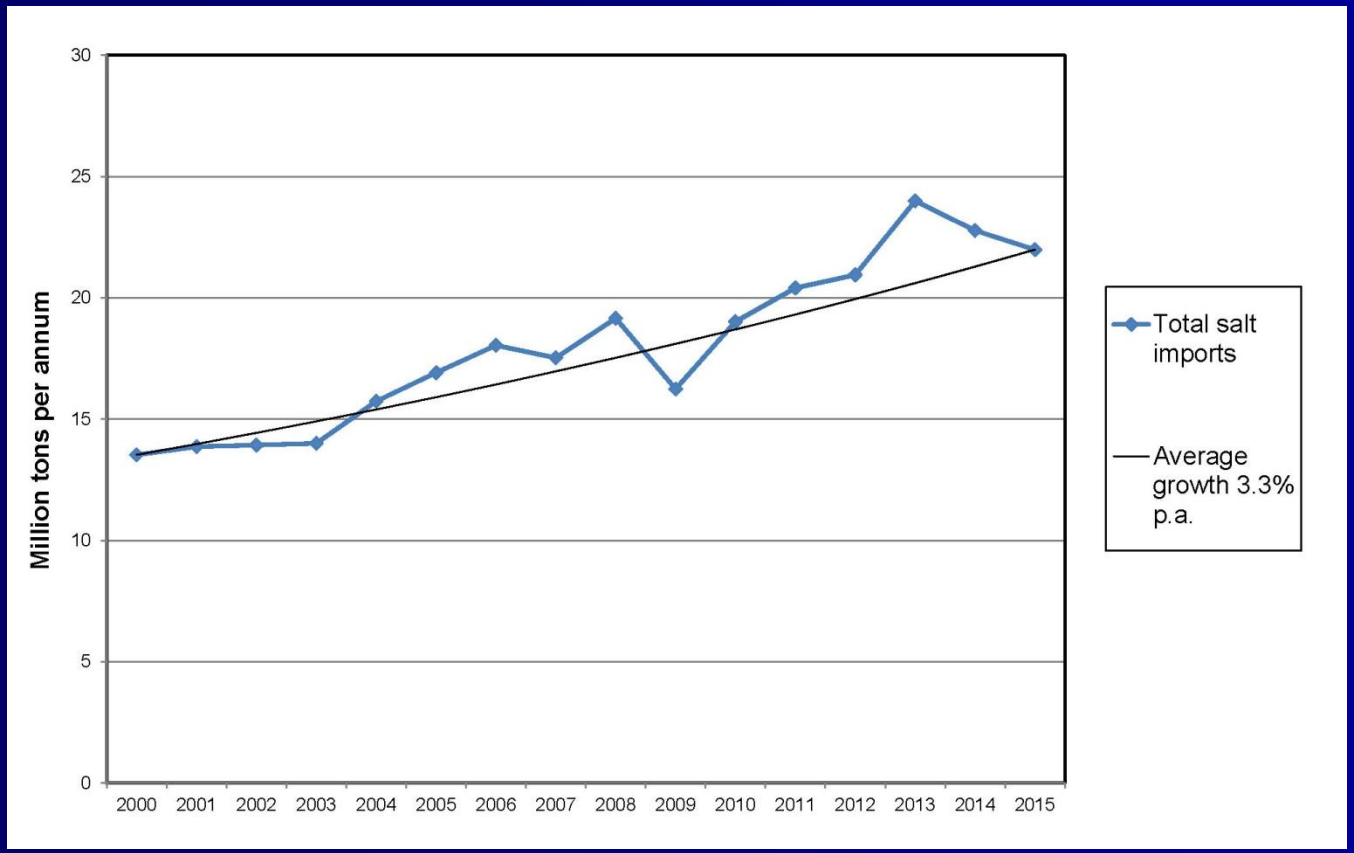
Total Salt Imports in Asia-Pacific



Since 2000, salt imports of 5 largest salt importers in Asia Pacific region have risen by 8.5 million tonnes, equal to 62%, or equal to 3.3% per annum.

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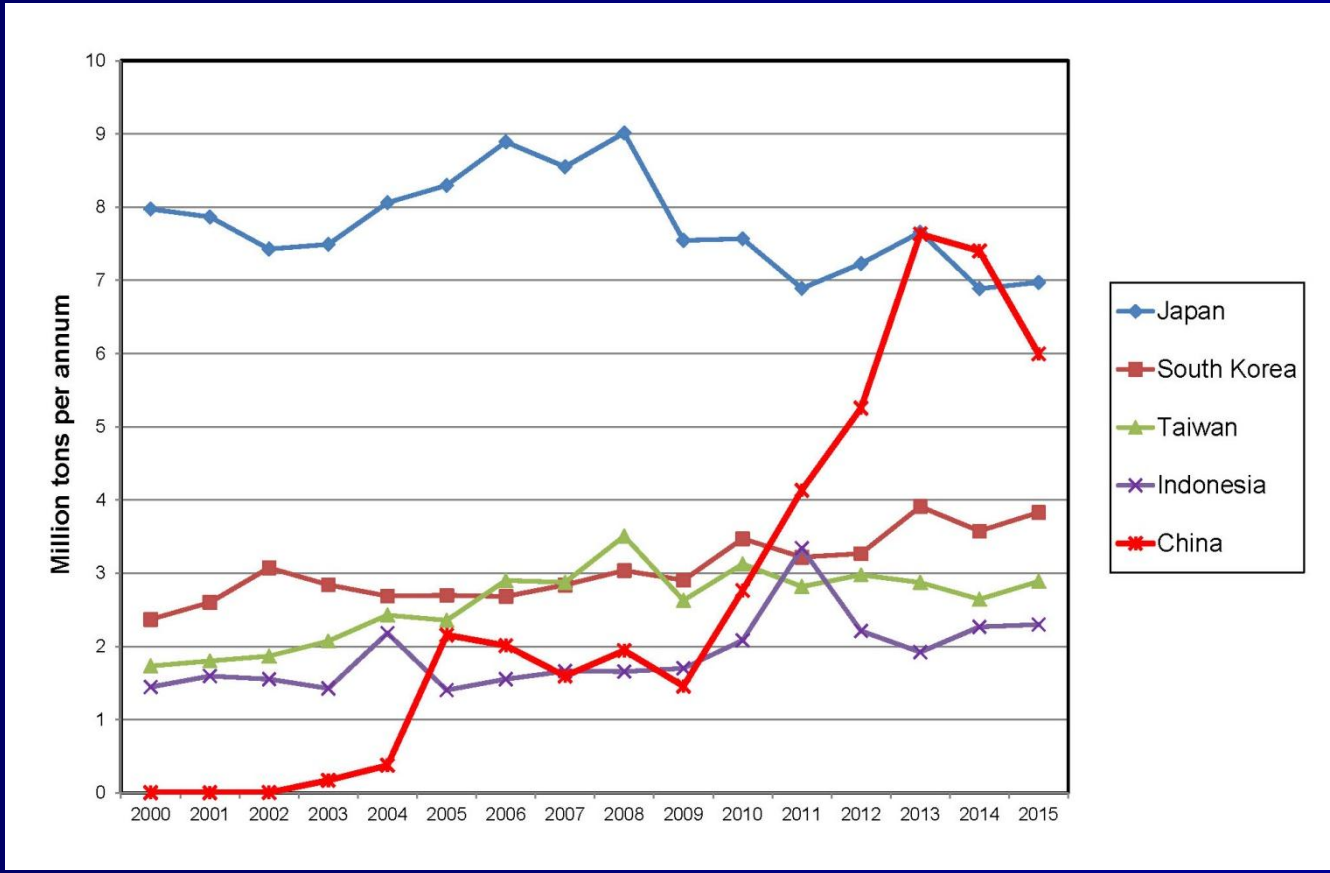
Largest Salt Imports in Asia-Pacific



Salt imports of the five largest salt importers in Asia Pacific region. Since 2000, these countries have increased their salt imports by average 3.3% per annum.

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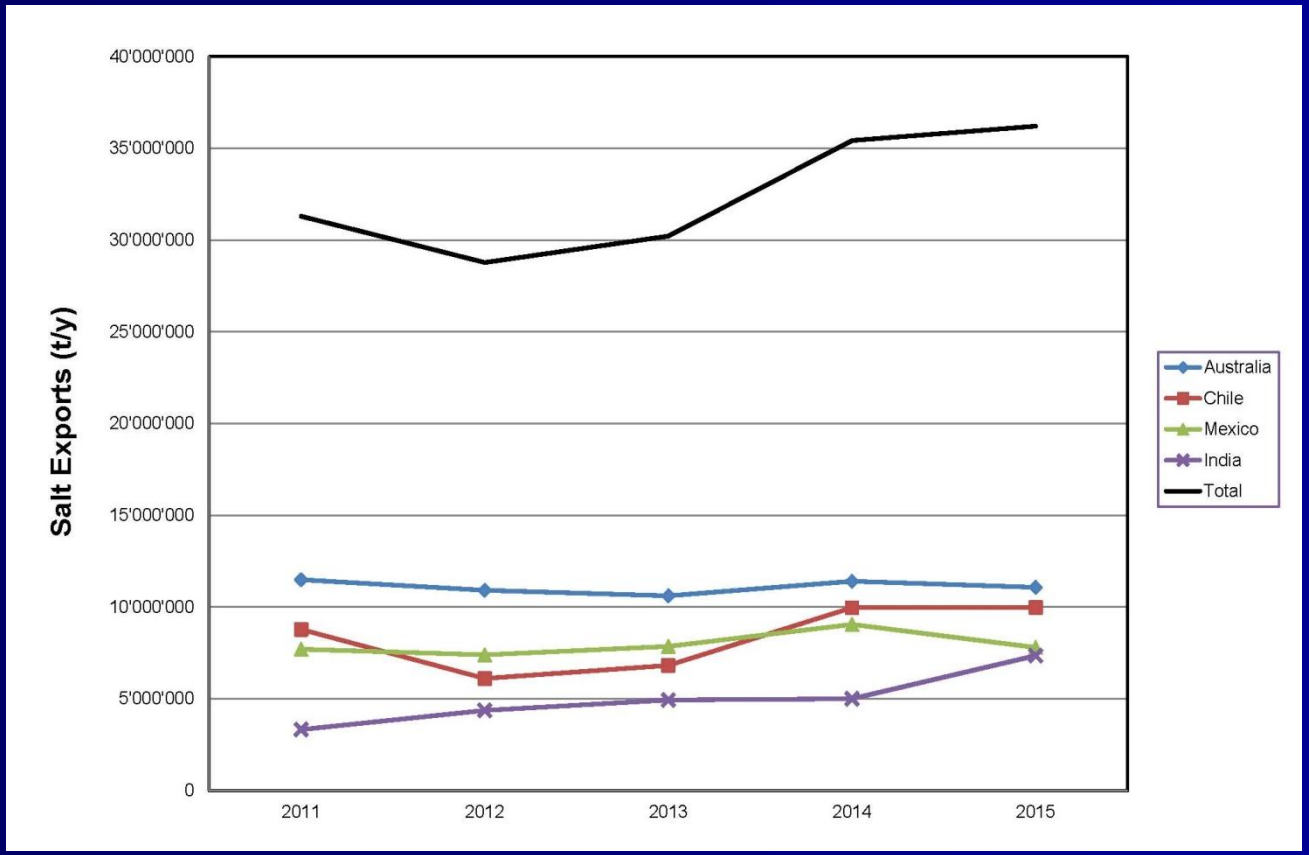
Salt Exports in Asia-Pacific



Since 2011, salt exports of 4 largest exporters in Asia Pacific region have increased by 5 million tons, or by 16% equal to 3.7% per annum.

However, India increased exports by 4 million tons, or by 120% equal to 22% per annum.

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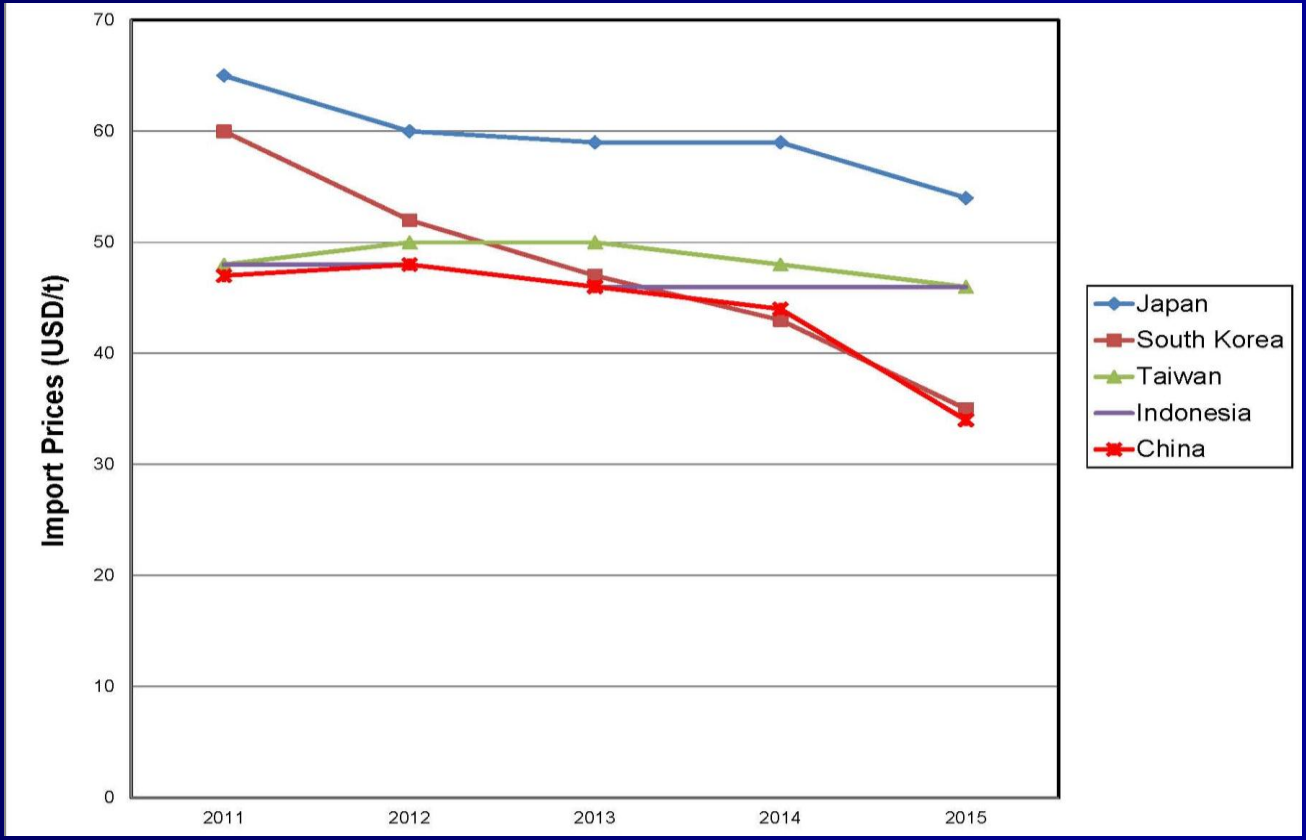
Salt Import Prices in Asia-Pacific



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Since 2011, salt import prices of 5 largest importers in Asia Pacific region have dropped by USD 11 / ton, equal to 20%, or to 5.5% per annum.

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New Developments in India

New developments are taking place in the Indian solar salt sector in the hot and arid state of Gujarat.

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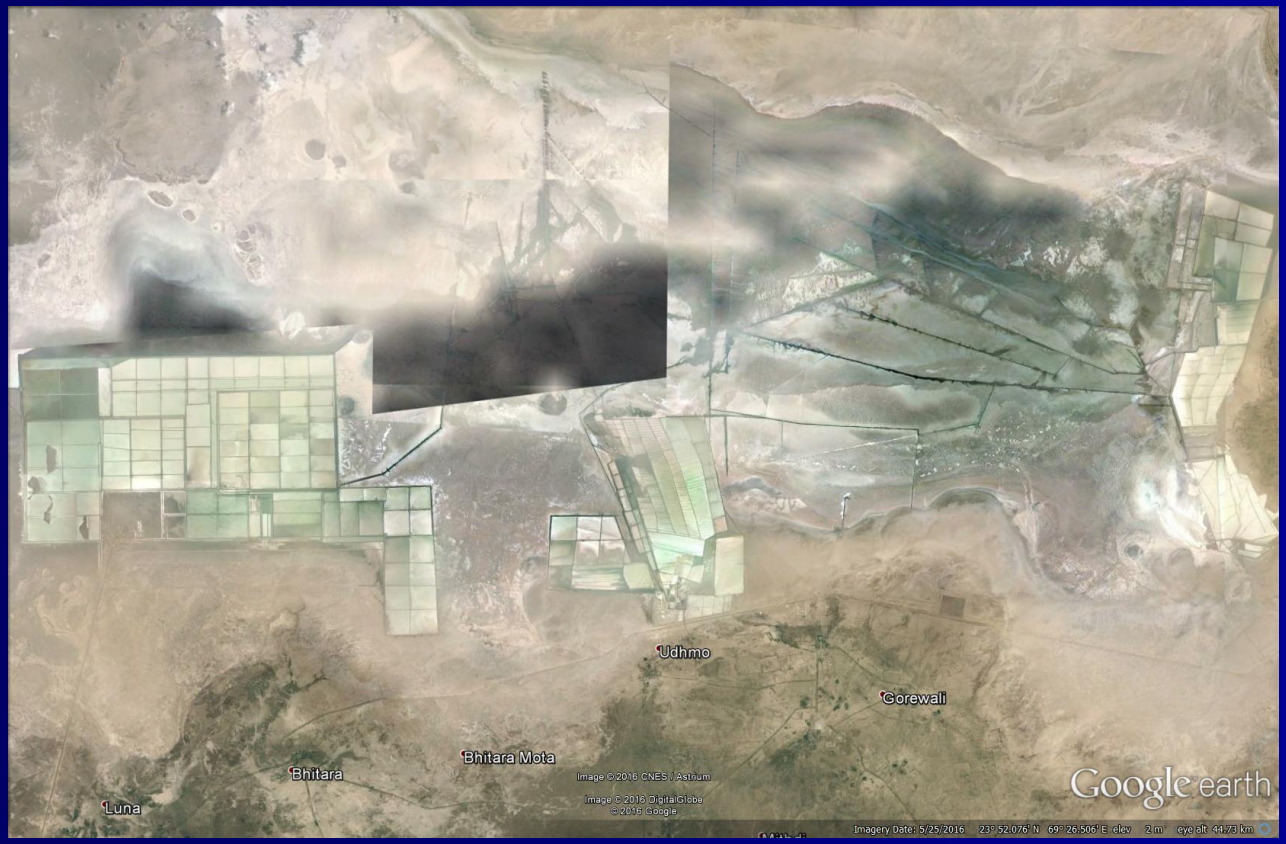
New Indian Solar Saltworks



This Google Earth image from May 2016 shows new Indian solar saltworks on the border to Pakistan.

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Jakhau Solar Saltworks

Jakhau solar saltworks and salt export terminal.

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Jakhau Salt Export Terminal

The Jakhau salt export terminal is located near shallow waters. Barges transport the salt to the Handysize vessels in the open sea.

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Salt Partners Supply Salt Harvesters

ROV DURRANT

Durrant salt harvester type 590-95, one of several machines supplied to Indian solar salt producers.

Salt Partners are proud to have participated in the success story of growing Indian salt exports.

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Salt Production in 7 European Countries 2006 - 2015

Country	Production in 2006	Production in 2015	Total change	Annual Change
	(t/y)	(t/y)	(%)	(%)
Germany	19’846’000	13’350’000	-33	-4.3
Russia	9’549’000	9’461’000	-1.5	-0.17
France	9’371’000	6’500’000	-31	-4
Netherlands	6’578’000	6’500’000	-1.2	-0.13
United Kingdom	5’499’000	5’000’000	-9	-1.1
Spain	4’406’000	4’425’000	+13	+1.4
Poland	4’837’000	4’100’000	-15	-1.8
Total	**60’131’000**	**49’326’000**	**-18**	**-2.2**

Sources: Roskill, BGS, USGS and national sources

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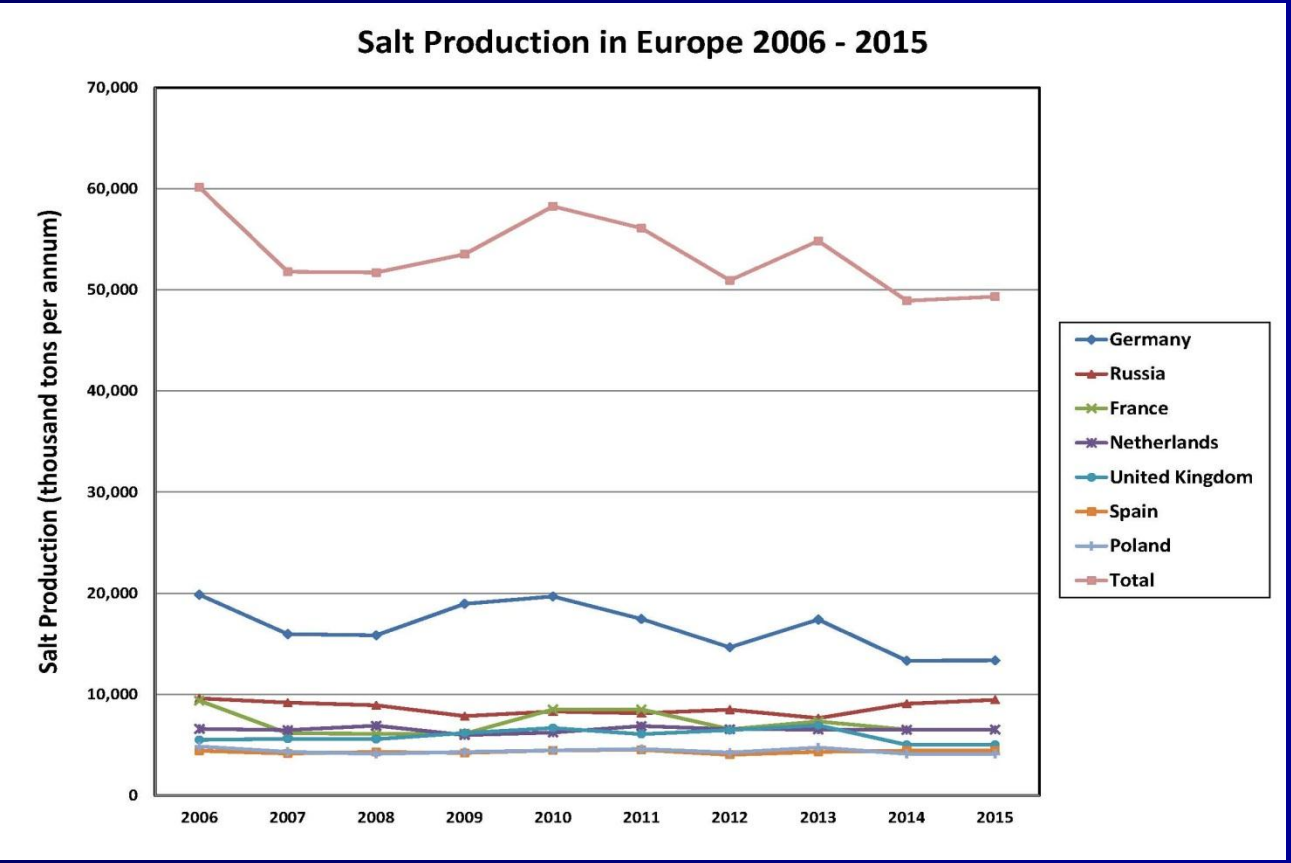
Salt Production in 7 European Countries 2006 - 2015



Since 2006, salt production in 7 largest European salt producing countries has fallen by 10.8 million tonnes, equal to -18%, or equal to 2.2% per annum. Most of the production loss comes from Germany (-6.5Mt) followed by France (-2.9Mt) and Poland (-0.7Mt)

Sources: Roskill, BGS, USGS and national sources

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Middle East

Middle East countries have not only the highest insolation for production of solar salt but also the most abundant sources of natural hydrocarbons needed for production of petrochemicals, organic intermediates, plastics, etc.

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ME petrochemical development projects

Some of the most spectacular petrochemical projects are being implemented in the Middle East, for example the Sadara Chemicals, a joint venture between Dow and Saudi Aramco, who invest 20 billion US dollars to produce 26 high value chemicals and plastics from natural hydrocarbons and salt. Salt Partners supplied the salt plant.

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Salt source for Al-Jubail industrial cities

Sadara Chemicals is the last of several petrochemical plants and oil refineries implemented as joint ventures between Saudi Aramco and world leading chemical companies. The are located in the Al-Jubail industrial cities. They source their salt from the Juaymah sabkha located about 40 km south east of Al-Jubail.

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Al-Jubail Industrial Cities

Al-Jubail Industrial Cities constructed in the past cover an area of approx. 10 x 15 km. they avail of their own deep sea terminal. The new industrial city area on the left is about 30% larger.

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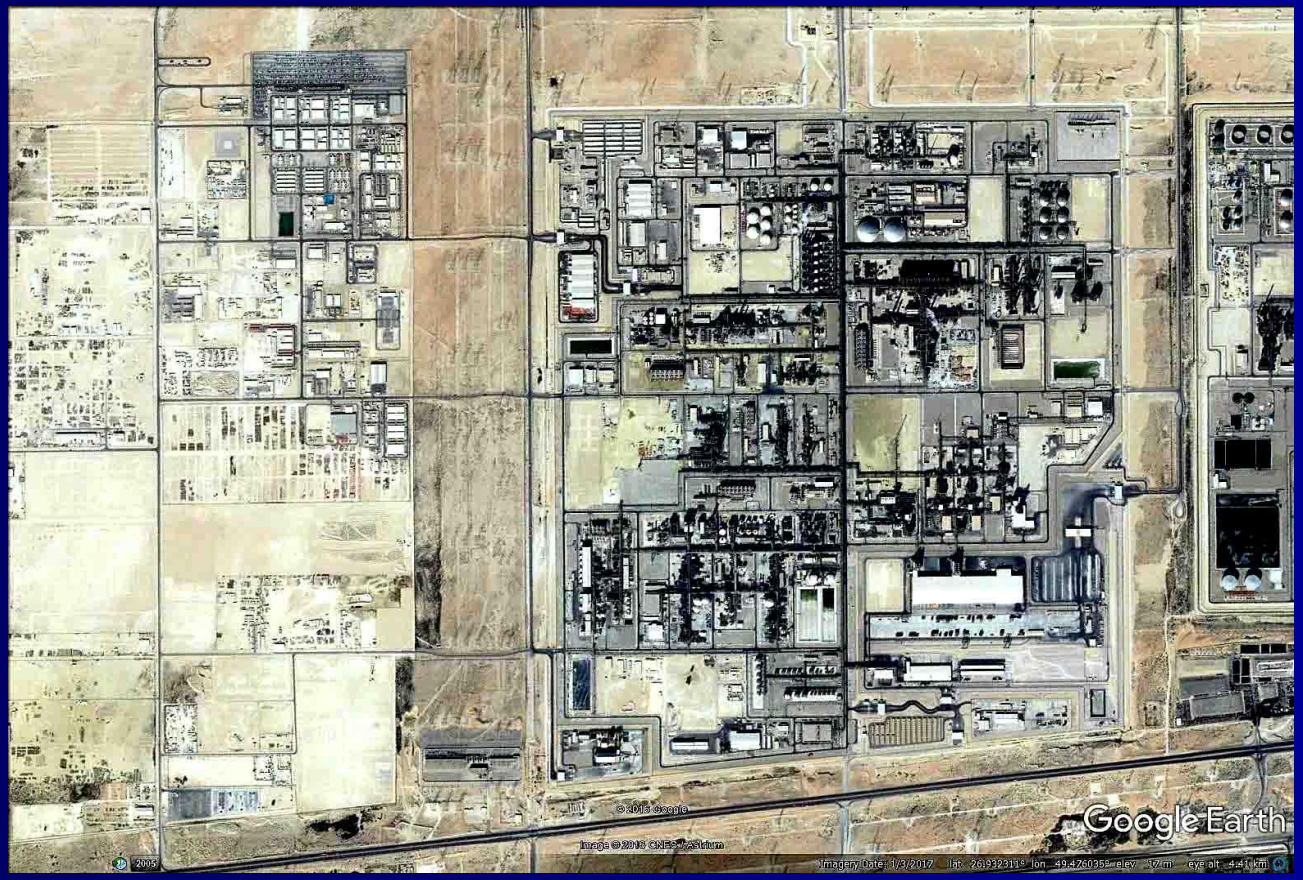
Sadara plant site



Sadara site is approx. 2.5 x 2.5 km or more than 6 km2. including contractor's camps on the left it is about double the size.

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Sadara ethylene cracker

Source: Arab News, August 29, 2016

Sadara ethylene cracker consists of 12 furnaces. Of these 7 will crack natural gas and 5 will crack naphtha. 3 of those can also crack natural gas.

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Salt mining at Juaymah sabkha

Salt is present in the Juaymah sabkha as a layer several meters thick covered by a layer of wind borne dust. After removing the top layer, salt is harvested from below the brine by dredgers.

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Conclusion

Salt production is moving from Europe to the Middle East Asia-Pacific and South America because:

- **Petrochemical industry in Europe is stagnating / declining**
- **Land, raw materials and energy are abundant there**
- **Capital and technology are transferrable**
- **Government policies are industry friendly there**

Europe has more chance in highly developed, sophisticated business areas than in commodities.

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Why not turn your salt into gold?

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