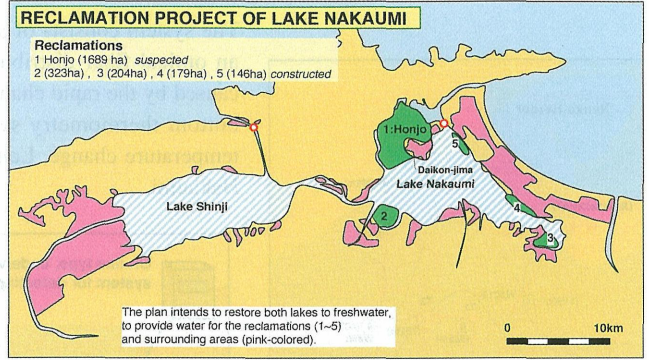


A PROBLEM AWAITING SOLUTION

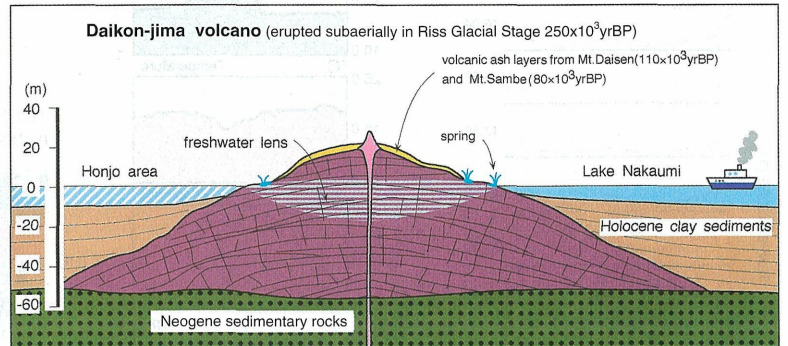
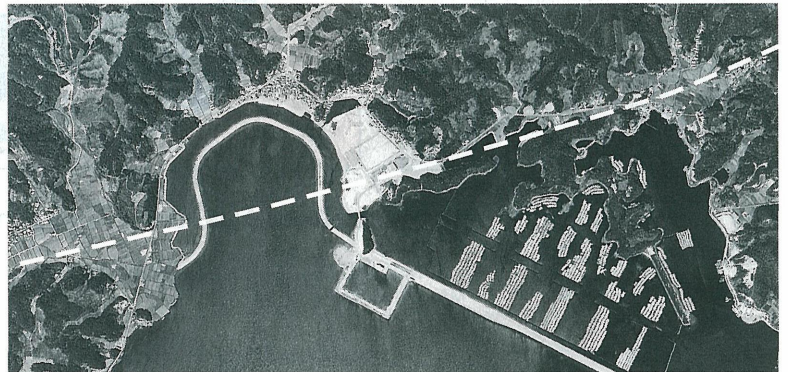
LAND RECLAMATION PROBLEM - PRO OR CON ? -

The Lake Nakaumi Reclamation Project by the Ministry of Agriculture was started in 1963, and has been suspended due to opposition by citizens since 1988, although more than 80 billion yen (about 67 million US\$) has already been spent. In the background there is a national policy to decrease rice production in Japan and a tacit acknowledgement of the lack of need to develop additional cropland through reclamation. However, from a financial viewpoint, the local government of Shimane Prefecture asked the Ministry of Agriculture to resume the project in 1995, notwithstanding the local opposition. Recently the Ministry of Agriculture has decided to carry out a 2-year study to decide the best use; either reclamation for farm land, or retention of the existing brackish lakes for fisheries.



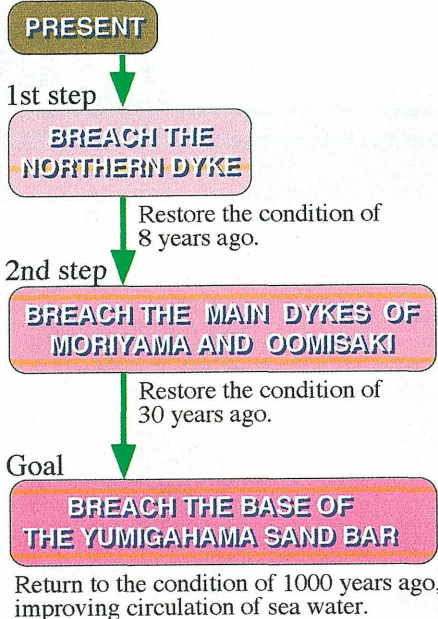
Main objections against the Nakaumi Reclamation Project

- *Potential water bloom of *Microcystis* and pollution in a freshwater lake
- *Lack of need of additional cropland
- *Protection of lake environment
- *Projected sea level rise in the 21st Century
- *Technical problems of making dry land below sea level
 - Honjo area is too deep for reclamation(deeper than -5m)
 - Daikon-jima Island in Lake Nakaumi is a porous Quaternary volcano and water could easily leak through it. Prevention would be extremely costly.
 - An active fault runs through the dykes. It is inappropriate and potentially dangerous to create sub-sea-level land in this situation.



A proposal of future land-use

" To use brackish lakes wisely, we must learn from their histories."



An image of the future use



Lake Shinji is used primarily as a shellfish fishery, which yields more than 30 billion Yen per year, and also for sightseeing and recreation.

Lake Nakaumi has been extensively polluted, and is less used by fishermen. It had a prosperous fishery 30 years ago, producing twice that of Lake Shinji.

MAIN COASTAL LAGOONS IN JAPAN

No.	Name	Type	Alt. (m)	Depth(m)		Area (km ²)	
				Max.	Ave.		
1	Onuma	D	1	2.2	1.6	4.86	•
2	Kucharoko	E	0	2.5	1	14.02	•
3	Komukenuma	M	0.4	1.83		7.77	+
			3	2.5		4.20	x
			3	2.5		5.03	o
4	Jibunonnaiko	E	2.5	3.8	1.2	5.81	•
			3	5.87		3.41	+
			3	6.0		2.98	o
5	Saromako	M	2.5	3.0		2.76	•
			0	18.29		151.18	+
			0	19.5		150.53	x
6	Notoroko	M	0	19.5		149.2	o
			0	20.5	8.7	150.29	•
			0	21.95		59.34	+
7	Abashiriko	E	0	22.0		58.49	x
			0	21.2		58.0	o
			1	21.2	8.6	58.51	•
8	Touhutsuko	E	0.6	16.46		34.25	+
			5	17.6		34.04	x
			0	16.0		32.8	o
9	Huurenko	M	0	16.8	6.1	32.87	•
			1	2.5	1.1	9.01	+
			0	10.97		53.43	x
10	Onneto	E	0	11.0		52.13	o
			0	11.0		52.0	•
			1	11.0		56.38	+
11	Akkeshiko	M	0	4.57		4.99	x
			0	6.7		5.06	o
			0	7.0		4.93	•
12	Touroko	E	1	6.7	1.2	5.51	+
			0	6.87		34.15	x
			0	6.9		31.99	o
13	Harutoriko	M	0	6.9		31.7	•
			0	6.9		31.80	+
			0	4.0		5.90	x
14	Yuutounuma	D	8	7.0		6.32	o
			8	7.0		6.53	•
			8	7.0	3.1	6.37	+
15	Obuchiko	M	8	7.0	3.1	6.37	x
			1.8	10.90		0.38	o
			5	8.5		0.38	•
16	Takahokonuma	E	5	9.0	3.4	0.37	+
			5	3.5	1.3	3.49	x
			5	4.95		3.93	o
17	Ogawarako	O	3	6.0		3.68	•
			3	4.7	2.1	3.71	+
			1	7.0	2.7	5.83	x
18	Juusannko	M/D	1	7.0	2.7	5.83	o
			4	5.5		107.96	•
			1.5	25.0		62.26	+
19	Hachirogata	E	1	25.0		64.8	x
			0	24.0	10.5	62.69	o
			0	2.3		48.43	•
20	Kamoko	E	0	7.0		20.80	+
			0	3.0		20.8	x
			0	3.0		18.07	o
21	Hossyouzuko	M	0	4.6		286.36	•
			0	4.7		223.29	+
			0	4.7		220.4	x
22	Kahokugata	E	0	12.0		27.64	o
			0	8.2		4.86	•
			0	9.0		4.83	+
23	Imaegata	E	0	9.0	5.2	4.95	x
			0	9.0		4.86	o
			0	9.0		4.83	•
24	Shibayamagata	E	0	2.7		4.71	+
			6.5	2.7		23.10	x
			0.8	2.1		26.0	o
25	Kitagatako	E	0	6.5	2.0	8.17	•
			0	2.8		3.20	+
			0.8	1.9		2.38	x
26	Kugushiko	E	1	4.6		5.40	o
			1	2.8		5.13	•
			2	4.9	2.2	1.71	+

No.	Name	Type	Alt. (m)	Depth(m)		Area (km ²)	
				Max.	Ave.		
25	Kitagatako		5	2.7		2.60	+
26	Kugushiko	E	0	3.0		2.0	o
			0	3.6	2.1	2.14	•
27	Hirugako	E	1?	2.5		1.40	+
			0	2.5		1.38	o
			0	2.5	1.8	1.40	•
28	Asokai	M	0	43.0		1.10	+
			0	38.0		0.9	o
			0	38.5	14.3	0.92	•
29	Kumihamawan	M	0	14.0	8.4	5.01	•
			0	20.0		7.26	+
			2	5.0		6.66	x
30	Koyamaike	E	1	8.9		7.25	o
			2	8.9		6.93	•
			0	7.0	2.8	6.88	+
31	Togoike	E	0	1.8		6.27	o
			4	7.5		4.1	•
			0	4.6	2.1	4.06	+
32	Nakaumi	E	0	7.8		108.80	o
			0	9.0		104.0	•
			0	8.4	5.4	88.69	+
33	Shinjiko	E	2.5	6.9		84.00	x
			1	6.4		83.13	o
			0.7	6.4		80.0	•
34	Jinzaiko	E	0	6.4	4.5	80.3	+
			3	2.2		1.35	o
			0			1.35	•
35	Mangokuura	E	0			3.72	•
36	Matsukawaura	E	0	5.5		6.33	+
			1.5	3.0		1.93	x
			0.6	3.6		12.20	o
37	Hinuma	E	3	3.5		12.0	•
			0	6.5	2.1	9.35	+
			2	7.58		187.7	x
38	Kasumigaura	E	2	7.6		189.17	o
			1	7.0		178.0	•
			0	7.0	3.4	168.18	+
39	Kitaura	E	0.5	3.5		52.75	x
			1	10.0		39.85	o
			1	10.0		78.8	•
40	Sotonakasakaura	E	0	10.0	4.5	34.39	+
			1	9.0		6.60	x
			1	8.9		6.13	o
41	Teganuma	E	0	8.9		6.01	•
			3	2.9	0.9	6.5	+
			1	1.8	1.7	11.6	x
42	Inbanuma	E	1	1.8	1.7	11.6	o
			3.90		1.07	+	
			5	3.9		1.23	x
43	Sanaruka	E	3	3.3	1.5	1.21	o
			12.12		5.36	+	
			0	12.1		5.43	x
44	Inohanako	M	0	7.0	4.6	5.48	o
			0	7.0	4.6	5.48	•
			0	13.0		66.92	+
45	Hamanako	E	0	15.8		72.04	x
			0	15.8		73.5	o
			0	16.6	4.8	66.05	•

E: Eutrophic Lake

M: Mesotrophic Lake

O: Oligotrophic Lake

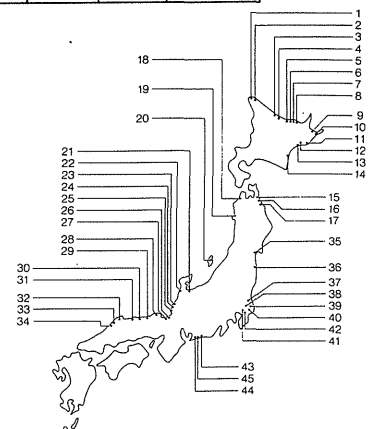
D: Dystrophic Lake

+ A. Tanaka, 1911

x S. Yoshimura, 1937

o S. Horie, 1956

• Environment Agency, 1989



LOICZ OPEN SCIENCE MEETING 1997 (10-13 October, 1997) Poster Presentation (Abstract)

IMPROVING LAGOONAL ENVIRONMENTS FOR FUTURE GENERATIONS

— A CASE STUDY OF LAKES NAKAUMI AND SHINJI, JAPAN —

T. Tokuoka, K. Takayasu, F. Takehiro and Y. Sampei

The Research Center for Coastal Lagoon Environments, Shimane University was established in 1992, and mainly studies the history of natural, cultural, and social environments of Lakes Nakaumi and Shinji, and their surrounding areas, to develop new ideas for the wise use of natural resources while maintaining a sound ecological balance. In general, coastal lagoon areas of Japan and other similar areas elsewhere in the world are to be investigated at the center in comparative studies aimed at contributing to solving global environmental problems. The main topics of research are (1) Natural environmental changes and sea-level changes in coastal lagoon areas, (2) Biodiversity and environmental changes in coastal lagoon areas, and (3) synthetic studies on geographical, cultural, and social environments of lagoon and their hinterlands. These topics are closely related to the aims of the IGBP-LOICZ Programs.

Coastal lagoons are very sensitive to sea level changes. Their environment can easily be changed by falling or rising sea level. Such changes are recorded in the bottom sediments, and the paleogeography of Lakes Nakaumi and Shinji areas is reconstructed. Lakes Nakaumi and Shinji are surrounded by many historic sites from the Holocene Period, are well recognized to have been used as fishery grounds, fishery ports and transportation bases by the ancestors.

The Lake Nakaumi Reclamation Project to make the farm land below sea-level and to restore both lakes to freshwater to provide water for the reclamations and surrounding areas was started in 1963, and has been suspended due to opposition by citizens since 1998. In the background there is a national policy to decrease rice production in Japan, and a tacit acknowledgement of the lack of need to develop additional cropland through reclamation. Main objections against the Nakaumi reclamation project are 1) Potential water bloom of *Microcystis* and pollution in a freshwater lake, 2) Lack of need for additional cropland, 3) Many technical problems of making dry land below sea level. The effects due to sea-level rise should also be considered. In order to use wisely these areas, we must learn from their individual histories.

We have developed a long-term observation system for the study of Halocline behaviour in brackish lakes and estuaries. This system was successfully carried out in Lake Nakaumi, and would contribute to control the move of oxygen-free saline water in near future.

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Data sources for Plates II to VIII

II. Modified from Tokuoka *et al.* (1990) and Nakamura *et al.* (1996) by T. Nakamura.

III. Uchida (1988,1989, ed.); Akazawa *et al.* (1994); Ege (1997, ed.); Ege (1997, ed.); Takehiro *et al.* (1997) . Photos were offered by Archaeological Res.Center, Shimane Univ. and Shimane Pref. Board of Education.

IV. Takayasu and Tokuoka (1993) ; Tokuoka and Takayasu (1992, eds.),

V. Airphoto(1947) by U.S. Army (published by Geographic Survey of Japan) ; Topographic map (published in 1977 by Geographic Survey of Japan, scale 1/25,000)

VI . Sampei *et al.* (1996, 1997)

VII. Tokuoka *et al.* (1996) ; Nishimura *et al.* (1994)

VIII. Airphoto (scale 1: 40,000) taken in 1983 by Geographic survey of Japan.