

# Returning Groundwater to the Earth. Protecting Water Resources

## Groundwater Recharge for a Sustainable Society

Sony Semiconductor Kyushu Corporation

Kumamoto Technology Center

Kumamoto is blessed with extensive groundwater resources, and is one of the few cities in Japan referred to as a "city of water".

Recently however, the reduction in the volume of that groundwater has become a serious concern.

It is an invaluable natural resource.

As one member of the community who takes advantage of this resource, the Kumamoto Technology Center, in cooperation with environmental NGOs, farmers, and local government, is now working on improving groundwater recharge using irrigated rice fields.

### Downward Trend Associated with Reduced Rice Acreage Policies and Conversion to Residential Use

The Kumamoto area centered around Kumamoto City has such rich groundwater resources that essentially 100% of its drinking and residential water supply is provided by groundwater. The main source of this groundwater is water that permeates into the soil from rice fields in the middle reaches of the Shirakawa river; 200 million tons of groundwater is pumped every year.

The reduction of the capacity of the region to recharge the groundwater, due to reductions in the rice acreage planted and increasing conversion of farmland to residential use, is causing a rapid reduction in the amount of this crucial natural resource.

Starting in 2003, the Sony Semiconductor Kyushu Corporation Kumamoto Technology Center has begun recharging this groundwater as its responsibility of a company that uses large amounts of water in its semiconductor manufacturing operations.

### Immediate Response to Calls from NGO Members

The impetus for the start of these efforts came

from calls from members of an environmental NGO.

When the Kumamoto Technology Center was founded, members of the local Kumamoto environmental NGO "Environment Network Kumamoto" published an open letter to Sony on the Internet titled "Concerning the Environmental Burden of the New Factory" and Sony responded. Given this background, Sony Semiconductor invited members of that NGO to the Sony "Environment Month Kickoff Ceremony" and asked them to present a talk. At that time, the NGO invited Sony to join a partnership and to join the NGO in activities to protect the groundwater. The former president of Sony Semiconductor Kyushu Corporation, Mr. Hamasaki, accepted that invitation to work together and started investigating concrete means for groundwater recharge.

### Achievement of Greater than Expected Recharge

Groundwater recharge was implemented through two methods. The first was to increase infiltration groundwater recharge by diverting water from the Shirakawa river to rice fields that were not being used for grow-

ing rice due to the (government policy of) reductions in the acreage planted. The second was to also divert water from the Shirakawa river to fields that are still used for rice production after the fall harvest was completed.

Based on a policy of return of an amount corresponding to the approximately 800,000 tons of water used by the Kumamoto Technology Center, Sony calculated the required area from the infiltration depth (the depth to which water infiltrates in one day). Sony then implemented this groundwater recharge over a total rice field area of 30 hectares (about six times the area of the Tokyo Dome sports area). Since the results achieved exceeded the originally expected infiltration depth (10 cm)\*, this project achieved a greater groundwater recharge than originally planned.

At the same time as continuing this groundwater recharge project, Sony is actively pursuing environmental protection efforts, such as reducing the amount of water used, at all its technology centers including the Kumamoto Technology Center.

\*: According to a survey performed by Professor Ichikawa of Kyushu Tokai University

### Main Points of this Water Recharge Effort

- It is possible for Sony's Kumamoto Technology Center to be environmentally neutral (with usage and recharge in balance) by returning to the aquifer an amount equivalent to the amount used by the center.
- The significance and importance of Sony Semiconductor Kyushu Corporation's groundwater recharge project have been widely recognized and it has been a stimulus for other groundwater recharge efforts.
- This was not an independent effort by Sony Semiconductor Kyushu Corporation, but rather was a joint effort by local government, local groups, environmental NGO, and Sony.

### Concrete Policies

1. Flooding rice fields that are the object of reduced rice acreage policies with water in the summer (mid June to mid July)  
Recharging is performed before fields not used for rice due to reduced rice acreage policies are used for other crops such as carrots.
2. Flooding rice fields that are used for growing rice with water after the harvest (late October to late November)  
Recharging is performed after harvest of rice, which uses organic fertilizers, but before planting of off-season crops.

Cooperating organizations:  
Shirakawa River Middle Reaches Improvement Committee,  
JA Kikuchi Kikuyo Office

### Current Status of Kumamoto Groundwater

**The recharge amount is falling rapidly**  
According to studies by Kumamoto City and Kumamoto Prefecture, whereas the recharge amount in 1990 was 705.5 million tons, that had fallen to 690 million tons in 2000. This is expected to fall to 660 million tons by 2010.

**Groundwater overextraction status**  
According to the 1990 study, the amount of groundwater influx (recharge) was 705.5 million tons. Since the amount of outflow was 718.1 million tons, the difference is a net loss of 12.6 million tons: the balance was in the red.

**Reduction in recharge land**  
Due to the policy of reduced rice acreage, the rice fields in the towns of Kikuyo and Otsu that function for groundwater recharge fell by about 25% for the two towns.

## Groundwater Recharge Structure Using Irrigated Rice Fields

### The secret of this rich groundwater resource: sieve-like rice fields

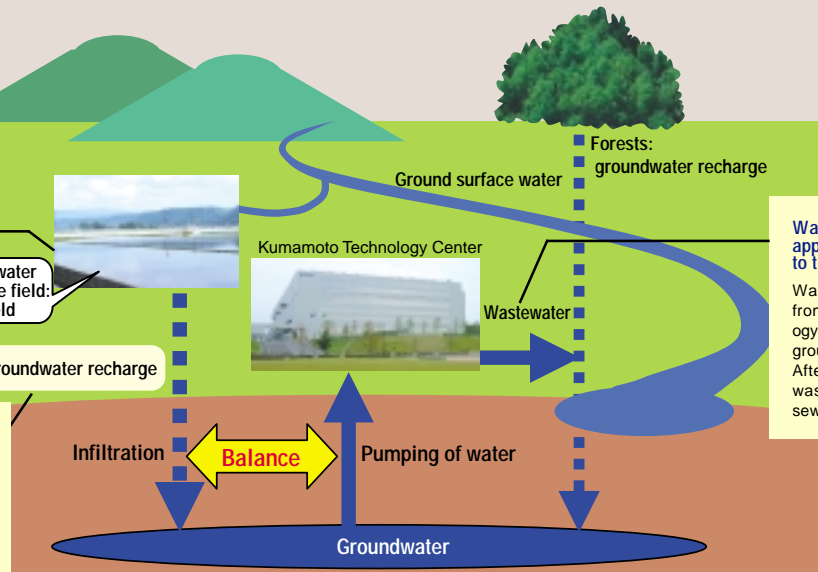
The irrigated rice fields in the middle reaches of the Shirakawa river (the town of Kikuyo and its vicinity) where the Kumamoto Technology Center is located, have the feature that the water filled in the rice fields permeates underground so quickly that they are called "sieve paddies". The rich groundwater resources of Kumamoto are created by this characteristic.

Groundwater recharge field: Sony field

Field: groundwater recharge

### Groundwater recharge: infiltration of water from rice fields

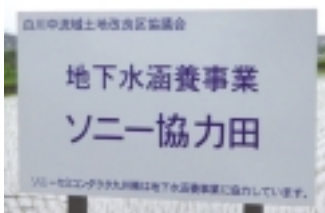
This plan aims at increasing the groundwater by groundwater recharge consisting of both diverting water from the Shirakawa river into rice fields out of the rice growing season and also diverting water from the Shirakawa river into rice fields that are the object of reduced rice acreage policies during periods when other crops are not being grown there.



Wastewater is processed appropriately and discharged to the sewer system.

Water used and discharged from the Kumamoto Technology Center is not diverted to the groundwater recharging fields. After appropriate processing, wastewater is drained to the sewer system.

	2003			2004
	June	July to October	November	
<b>Groundwater recharge schedule</b>	Recharge field management Contracts concluded • Ohikku land improvement area • JA Kikuchi	Recharge fields Rice planting Mid June Summer groundwater recharge	Crop growth period	Recharge fields Filling with water Early November The recharge period is after the harvest
	The 2004 groundwater recharge plan will be determined based on discussions with concerned parties from Kumamoto City and other groups. In particular, these discussions will determine what amount of cooperation and support SCK will provide to the Kumamoto City Groundwater Works.			



Sign indicating that the field is being used in cooperation with Sony for groundwater recharge



### Rice harvested from a groundwater recharge field.

This rice was not only distributed to people who supported these efforts, but was also used in the Sony Semiconductor Kyushu Corporation employee dining hall. Assuring that every Sony employee is aware of the significance of these efforts, and increasing environmental awareness are important goals for this project.

## Reminded Anew of the Importance of Groundwater



When we began studying concrete approaches with the members of the Environmental Network Kumamoto group, the first proposal we received was for local production/local consumption, that is, products produced in an area should be consumed or used in that area. We contracted with local farmers who accepted that we would flood the rice fields after the rice grown with organic fertilizers was harvested, and Sony Semiconductor Kyushu Corporation purchased that rice for use in the Kumamoto Technology Center employee dining hall. We had the contracted farmers use organic fertilizer and added the cost of flooding the rice fields to the usual cost of organically grown rice. These costs were paid by Sony Semiconductor Kyushu Corporation.

I thought that this was an excellent plan, and immediately contacted JA (the Japanese nationwide agricultural organization) and obtained their cooperation. However the number of farmers who were using organic farming was still quite small. Furthermore, after the rice harvest, some rice fields were used for other crops such as carrots, and the period that the rice fields could be used for groundwater recharging was limited to one month out of the year. As a result, this approach could not achieve the groundwater recharging goal of 800,000 tons. While wondering what could be done,

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I learned from an NGO member that the Shirakawa River Middle Reaches Improvement Committee had established a groundwater recharging plan for locations not used for rice cultivation whose main purpose was control of harmful insects. By covering part of the costs of that plan, Sony Semiconductor Kyushu Corporation was able to acquire the target groundwater recharging area required. I feel that during this project, all of us, the NGO members, local government, and JA, were able to forge excellent cooperative relationships.

Through these efforts, I became more strongly aware of the importance of groundwater for the future. We must not be satisfied with merely recharging by the amount we have used, but Sony Semiconductor Kyushu Corporation as a whole must continue to strive to reduce the amount of water used.

Just as people who live in Oze, a region blessed with a rich natural environment (and famous for its wild aquatic plants), would think it only naturally that they should protect Oze's environment, we also must, as users of the Kumamoto groundwater resource, work to protect this region's environment.