

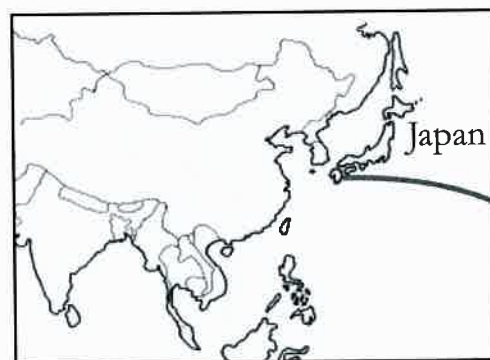


TOROKU

Bridging Arsenic-affected Asia

Asia Arsenic Network

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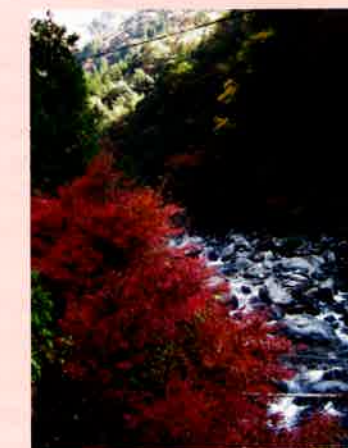
Toroku
 Iwato, Takachiho Town
 Miyazaki Prefecture
 Japan
 No. of Household 41
 Population 130
 (Male 71, Female 59)
 as of 1 February 2006

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OVERVIEW

Natural Garden

Toroku is a village in a valley located halfway down the Mt. Furusobo (1,633m). The panoramic view of Toroku at a road high up is very beautiful like a natural garden. Mountains rising on the eastern and western sides are covered with green trees, and a clear stream runs through the bottom of the valley hitting crags with a splash. The flowers are in full bloom in spring, waterfalls flow down shining white in summer, leaves turn red in autumn, and the trees are covered with silver frost in winter. Each of the four seasons offers its scenic beauty. Strolling through the village, you will find many gods and Buddha in small shrines and temples, which reminds you that Toroku was once a divine place for Buddhist priests.



Toroku in autumn

History of Mining Pollution

Documents record that in Toroku a Silver Mine was opened during 1600 AD and flourished until the middle of 19th century under the direct management of the Nobeoka clan. However, the mine was eventually closed after a period of scanty production of copper or zinc ores. In 1920, the mine was reopened by prospectors in search of arsenopyrite and the mass production of poisonous arsenious acid by burning arsenopyrite in a primitive furnace was begun in Toroku. As a consequence, air, river water and soil of the region were highly contaminated by arsenic, and crops, cattle, horses, and people were severely affected. Villagers made formal requests to the mining company and the administration for the prevention of damages. Nobody paid heed to them. Many mine workers and residents died suffering from arsenic poisoning. And finally, the mine was closed in 1962 ignoring the victims of arsenic poisoning living silently in the mountainous village.

Patients' Struggle

In the later half of 1960s, environmental pollution in Japan was so serious that the country was called an 'archipelago of public pollution'. Patients of the 'Itai-Itai-byo' disease*1), Minamata disease*2) and Yokkaichi asthma*3) filed suits in courts for compensatory damages against responsible companies. Stimulated by these actions, villagers of Toroku came forward to claim themselves victims of public pollution. In November 1971, a primary school teacher made a presentation on the results of his survey on the arsenic pollution unknown to the world for a long period. Mass media treated the presentation with due priority which brought the incident of arsenic pollution in Toroku into light. In February 1973, the Ministry of Environment of Japan recognized and declared Toroku as an area of pollution-related disease after admitting the several cases of arsenic poisoning. The patients decided to bring a case into court for compensation of their health damages against Sumitomo Metal Mining Company as a defendant. An organization named Association to Support the Victims of Toroku and Matsuo Mine Pollution backed their struggle up. The case, filed by Toroku victims, came to an end with the reconciliation at the Supreme Court in October 1990 after the patients had won the suit at both of the District and Higher Courts. The 20 years long struggle for the restoration of human rights laid a foundation to save patients.

*1) "Itai-Itai-byo" Disease: Disorders of the kidneys and bones caused by cadmium discharged by a mining company.

*2) Minamata Disease: A disease caused through eating fish and shellfish contaminated with methyl mercury in the effluent from chemical factories in Minamata and Niigata.

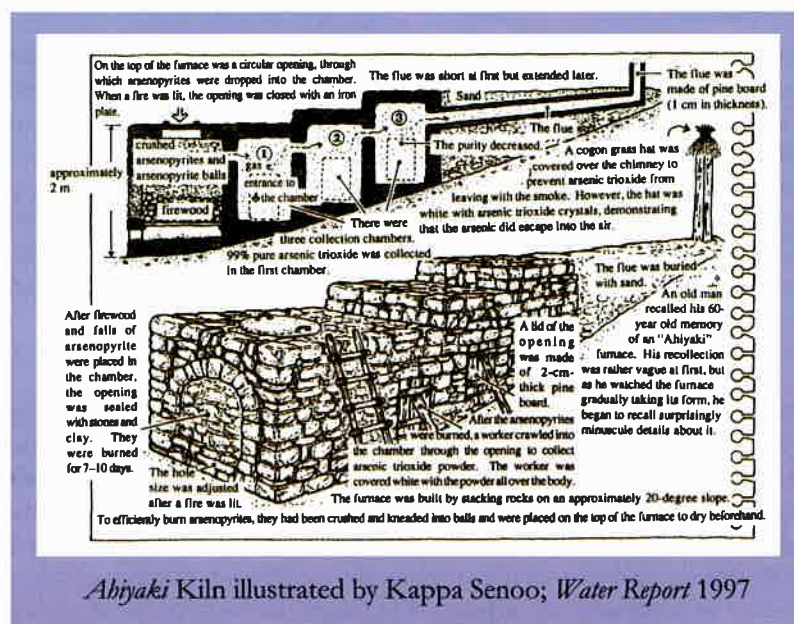
*3) Yokkaichi Asthma: Respiratory disorders caused by air pollution at a petrochemical complex in the Yokkaichi area.

Production of Arsenious Acid

In Japan, in the old days, arsenious acid was called 'arsenic frost' since white powder like frost fell when arsenic-containing ores were burnt. At the beginning of the 20th century, new insecticides were developed using arsenious acid, which in turn called for the production of arsenious acid in large quantities. The German army also used poison gas made with arsenious acid during the World War I. Though Germany lost the war and its chemical industries declined, Japan took the place of Germany as a major producer of arsenious acid. In 1930s, crop-dusting of lime arsenite began to get rid of harmful insects in the cotton fields in South part of the United States of America, the main importer of arsenious acid.

Arsenious Acid (Arsenic trioxide As_2O_3) is a deadly poison of a lethal dose of 0.1 mg to 0.3 mg generally used for agricultural chemicals, medicines, insecticides, pigments, poison gas, etc.

Before the World War II the annual output of arsenious acid in Japan was around 3,000 tons. The Ashio Copper Mine Refinery produced most. Copper ores in Ashio contained 0.8% to 2% arsenic. When copper ores were smelted, arsenious acid was carried away in the smoke. It was collected in a dust catcher and made into product. In the same period, arsenious acid was made in a different process at the mines that produced arsenopyrite. A kiln with stepped chambers was built with stones, where arsenopyrite was burnt to collect arsenious acid. This process was called *abiyaki*, i.e. arsenic-burning.



Abiyaki began in the Toroku mine in 1920. Arsenopyrites were dug out from the pit. Workers crashed the ores with a hammer into small pieces and made arsenopyrite balls with their bare hands. The kiln had four chambers. In the first chamber, woods were kindled to burn arsenopyrite balls. Arsenious acid drifted with smoke into the following three chambers and settled down. Some arsenious acid escaped from the chimney and spread around the mine. The ores burnt up within seven to ten days and ore cinders remained in the kiln. Thus the ore cinders were dumped into the Toroku River running in front of the mine and the river water carried it out into the rice fields through irrigation canals. Since the mine was located in the center of the village the entire environment of Toroku including its air, river water and soil were contaminated by arsenic through the *abiyaki*.

Reports by a Veterinary Surgeon

As *abiyaki* began at the Toroku mine in 1920, strange phenomena were being observed in the village. River fishes started dying out, honeybees were being disappeared, mushrooms were bearing no sprout and bamboos were becoming withered. Suffering from unknown disease the cattle fell down, one by one. In April 1925 a veterinary surgeon visited the village to dissect the body of a dead cow and made reports on his visit and the results of the dissection.



From the Report by the Veterinary Surgeon

"On the north sides of mountains there was a pathetic sight like a place after a fire. Cedars of 20 to 30 years of age withered and stopped growing or turned brown. Most of bamboos and trees were dead, making the sight desolate. Arable land was dilapidated and appeared as if it could no longer grow farm products. The village which once boasted of its wealth until a few years ago looked lifeless. Although the river water was clear, stones in the river were dirtily red, and the fish that were abundant three years ago could not be seen now. On visiting a house, I found a young woman having a hoarse voice and a pale face. The workers at the mine had sore and swollen faces with the eyes badly congested. Abnormality was not found among dogs, but certainly cats were suffering from malnutrition. What on earth was causing all of these? I examined two cattle. They were undernourished, unhealthy, and staggering. Their fur and skin lost sheen, and they had poor appetite. Their temperatures were normal but pulses were feeble. The respiratory organs were functioning but the stomachs were moving only slightly. The cattle sometimes slobbered, or foamed at the mouth, and trembled all over. Both cattle showed the same symptoms. I could not name the disease because it was the first time for me to see such symptoms. According to the experts of the Takachiho Police Station and the District Stockbreeders Association who diagnosed ten sick cattle and horses last autumn at the request of the village mayor, they had the same symptoms with the fur lost here and there on the bodies. The experts, too, could not name the disease, I heard."

From the Report on the Dissection of a Dead Cattle

"The eyes of the dead cattle were sunken and it was swollen around the belly. Furs came off easily with a single pick. Almost no subcutaneous fat was found, confirming malnutrition. The lymph nodes under the jaw and on the throat were swollen with pus. The lung was dark purple and hard like the liver. The first and second stomachs were full of gas and blackened mucous membranes came off the wall of the stomachs. The third stomach was almost filled with something dry and hard and was connected to the fourth stomach only through a small hole in the middle. The toxic substance that afflicted the respiratory and digestive organs were certainly moving around all the organs through blood affecting the liver, kidneys, heart and nerve. The causative substance seemed to have affected not only the respiratory or digestive organs but also the whole body. Gathering from the symptoms of sick cattle and the condition of surrounding trees and grass, I assume that the disease is a poisoning by the successive intake of a toxic substance."



The Causative Substance

The Dissection on a Dead Cattle was carried out by Mr. Nichie Suzuki, a 20-years old veterinary surgeon on 7th April 1925. He suspected that the cattle died of poisoning by arsenious acid and thought that it would be necessary to detect arsenic in the internal organs of the dead cattle to specify the causative substance.

**'Mining Industry First'
at the cost of
Agriculture**

Neglected Results of the Dissection

It was 9th April 1925, Mr. Tokujiro Kai, the mayor of Iwato village where the Toroku mine was located, visited the Miyazaki Prefecture Office with a bottle filled with internal organs of the died cattle and requested the analysis of a toxic substance. But the respective officer responded: "The bottle has no seal. I cannot trust that the contents are genuine". Then Mr. Kai, saying angrily 'Your suspicion is totally unnecessary', returned home leaving the bottle over there. The result of analysis never reached him. The Miyazaki Prefecture neglected the dissection by the veterinary surgeon and the cause of strange diseases of cattle and horses was thus remained unidentified for decades.



A funeral of an arsenic victim (1977)

The Perished Kiemon Family

A seven-member family of Sato Kiemon lived only a hundred meter away from the *abiyaki* kiln. Keimon family members started suffering from a similar disease. Their skin turned black and voice became hoarse. All of them coughed badly, spit out bloodstained phlegm, and suffered from swollen livers. In November 1930 Saki, the wife of Kiemon, died first at the age of 46, followed by the deaths of Kaoru (17), the third daughter, in February 1931, and Satsuki (24), the eldest daughter, in May the same year. Next year, Kesaki (27), the eldest son, passed away in June and then Kiemon (52) himself in November. The decease of five of a seven-member family in two years was a horrible fact indeed. Tsugimi, the second daughter who was married, died in April 1937 at her age of 28, and Masataka, the second son who sold the house and went wandering, died in April 1951 at the age of 39 and was buried while no one was left to receive his body. There was not a single doctor who could find the cause of the disease that the Kiemon family had been suffering from.

'A village can be abandoned since the Mine must survive'

In Toroku there was a self-governing body named Wago-kai (Harmony Association). The organization requested the mining company repeatedly to stop the production of arsenious acid. In February 1941, when the time was towards the Pacific War, Wago-kai sent a few representatives, summoned by the Fukuoka Supervision Bureau of Mines. The officer at the Bureau said: "Underground resources are useful for the country. At the time of emergencies, a few villages can be abandoned since mines must survive." Since the middle of the 19th century, in Japan, the policy to prioritize the mining industry has been carried out even sacrificing agriculture.

'Make a furnace in the village office premises'

In November 1941, the *abiyaki* (production of arsenious acid) was suspended. After 10 years, the mining company announced a plan of building a new furnace and restarted the production of arsenious acid. Wago-kai decided to oppose the plan unanimously. But when The Mayor of Iwato village persuaded the villagers to accept the plan on the condition that the mining company should pay lump sum money for their cooperation, the organization run by male villagers changed its mind to accept the condition. The Toroku Women's Club, who felt those men untrustworthy, met the village mayor and complained in tears: 'If you say that the new furnace is harmless, please have the furnace built in the village office premises. We will carry the ore'. Despite all these actions, the mining company constructed a new furnace and restarted producing arsenious acid in March 1955. Again, trees and grass grew little, mushrooms became disappeared and honeybees started dying out.

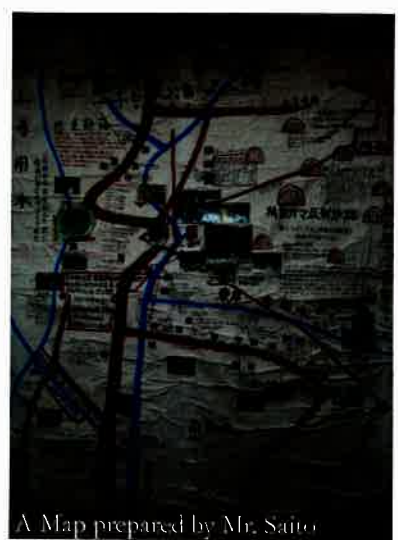


The refinery (new furnace)

Epidemiological Survey by a Teacher

A teacher discovered the arsenic pollution

The Toroku mine was closed for the second time in 1962. The ruins of the mine used as the playing ground for children. Mr. Masatake Saito, a teacher of Iwato Primary School, was concerned at the sight of it that the ruins might affect the health of children. A physique survey carried out among the school-going children in villages showed that the health condition of Toroku children was inferior. Teachers of Iwato Primary School distributed questionnaires to the Toroku residents on the deaths and clinical histories of the families. Forty-six households, 90% of the total, responded, and it was found that 92 people had been died in the period between 1913 and 1971 at the age of 39 on an average. Seventy-four people out of a total 250 residents had diseases in respiratory, digestive, urinary and circular organs and in nerve.



A Map prepared by Mr. Saito

Media shed light on Toroku

On 13 November 1971, Mr. Saito made a presentation on the findings at a teachers' research conference and appealed that many patients of pollution-related diseases were waiting for help in a remote mountainous village. The presentation was reported in the press and on television, which shed light on the Toroku arsenic poisoning as a social issue. Local doctors denied the survey results commenting that the survey was conducted by laymen and therefore not scientific. The Miyazaki Prefectural administration carried out health examination of Toroku residents. It was a very brief examination. Later the Miyazaki Prefectural administration distorted the health damages and reported that only seven people were found with sequelae of arsenic poisoning on the skin. Mr. Saito prepared a 'Map of the Deceased near the Toroku Mine' in opposition to the movement to deny the damages. The map written on a large piece of paper contained the names of the diseases they died of each household. Experts of public health consider it as 'a magnificent epidemiological survey'.

Confirmation by Experts

It was nine years after the closure of the mine operation when the Toroku pollution became a social issue. How could the environmental pollution at the time of operation be proved? The Experts Committee for the Social and Medical Surveys in the Toroku Area directed its attention to the dust in private houses. There was no ceiling to a house in Toroku. Dust had accumulated on beams for a long time. On analysis they found arsenic of concentration as high as 8000mg/kg in the dust of a house next to the mine refinery. It was an evidence to prove that the smoke with arsenic fumes had been entering the house. The farther the houses were from the mine refinery, the lower the arsenic concentration in dust was. The Experts Committee's report stated:

There was a correlation between arsenic content in dust in houses and the distance from the *abiyaki* furnaces. They also examined the tree ring of a cedar and found that the years when the width between one tree ring and the next were narrow almost coincided with the period of mining operation. Thus they confirmed finally that there were damages caused by smoke during the mining operation.

	Distance from the Kiln	Distance from the Furnace	Arsenic Content (ppm)
Sample 1	100m	400m	8000
Sample 2	200m	300m	1350
Sample 3	600m	1070m	210
Sample 4	1050m	500m	230
Sample 5	600m	900m	200
Sample 6	1100m	1200m	80

Struggle for human rights

Administration tried to bury the arsenic pollution incident

In 1972, Miyazaki Prefectural administration identified seven people with melanosis, keratosis and Bowen's disease on the skin as having 'chronic arsenic poisoning'. But, they did not consider the diseases of internal organs and the nerve as the effects of arsenic since those diseases 'could arise from other causes'. The governor of Miyazaki Prefecture acted as a mediator for compensation between the seven patients and Sumitomo Metal & Mining Company, the last holder of the mining right at Toroku. Though the patients requested for compensation for all the diseases they had, the amount of compensation based on the skin lesions was awfully low in respect to their physical damage. Since the mediation was forcibly carried out in a hotel isolating the patients from the outside, they were anyhow bound to give in to the power of the administration and accept the compensation of low amounts.

Compensation through a Suit

Mrs. Tsurue Sato and Mr. Hideo Tsuruno raised a movement of protest that the mediation by the governor was 'unjust'. Many residents also claimed that they were also pollution-related patients. The patients formed the 'Association of the Toroku Arsenic Pollution Victims' under the banner of the restoration of human rights. The Japanese Bar Association sent a survey team to Toroku and published a report concluding: 'The irresponsibility of the administration and the cozy relationship with the mining company are doubly infringing the human rights of the victims'. Doctors from Okayama University and Kumamoto University carried out a medical examination and made it clear that various symptoms were observed all over the body. The patients filed a suit in a court for compensatory damages against the Company. The struggle of the patients was also supported by the citizens who set up the 'Association to Support the Victims of Toroku and Matsuo Mine Pollution'. Finally, the patients won the case at the District and Higher Courts and the defendant appealed to the Supreme Court. In 1990 the patients accepted reconciliation at the Supreme Court for 'a settlement while alive' while a period of fifteen years had already been passed since they filed the suit.

Compensation by Law

Under the 'Law for Compensation and Related Issues of Health Damages Caused by Environmental Pollution' enacted in 1973, a system was established to pay compensation to the victims of environmental pollution from the fund contributed by the companies which caused pollution. The certified patients receive various allowances in relation to medical treatment. The Ministry of Environment and the Miyazaki Prefecture initially limited the symptoms to certify patients or to judge compensation. To correct the wrong views on the symptoms, the patients, along with the supporter, fought at the inspection committee which deals with complaints on administration. During that period, many medical papers were issued, and the symptoms as conditions to certify and subject to compensation were extended accordingly. As of 20 February 2006, the number of officially certified patients amounts to 173 people (male 85, female 88); out of whom 118 people (male 64, female 54) are dead.

Compatibility of the Compensation Law and a Lawsuit

The sentence at District Court stated that the compensation under the Law is to cover 'the damages to property' but what the patients asked for in the suit is the compensation for their 'mental damages' and therefore their claim is compatible. In short, it confirmed that they could hold the company liable in a suit while receiving compensation under the Law. The 20-year long struggle to restore their human rights prepared a way to save victims.



Patients fought hand to hand

Chronic Arsenic Poisoning

Health surveys have been conducted on Toroku arsenicosis patients over 30 years. Medical reports defines that various diseases have been observed all over their bodies, and among those cancers are frequently found on the skin and in respiratory and urinary organs.

Mucocutaneous Symptoms First, Leading to Cardiovascular Lesions and Malignant Neoplasms

From 1975 to 1987 Dr. Nobuyuki Hotta examined 147 arsenicosis patients in Toroku. He reported the results in "Clinical Aspects of Chronic Arsenic Poisoning due to Environmental and Occupational Pollution in and around a Small Refining Spot" (*The Japanese Journal of Constitutional Medicine*, Vol. 53, No. 1-2, 1989). In the report he stated on the case of Toroku arsenic poisoning: "From the symptomatological viewpoint main clinical manifestations observed among the subjects were divided into three groups in accordance with each stage of the disease as follows:

1. The initial stage: dermatitis, keratosis, conjunctivitis, rhinitis, pharyngitis, laryngitis, bronchitis, gastroenteritis
2. The second stage: peripheral neuropathies, Raynaud's phenomenon, hepatopathy, nephropathy, melanosis, depigmentation, hyperkeratosis
3. The late stage: cardio- and cerebrovascular disease, gangrene in the limbs, malignant neoplasms



Medical examination by doctors of Okayama University

Mucocutaneous syndrome in the initial stage is well known as the incipient signs arsenicism. A retrospective study in the series revealed that the most of the subjects (81.6%) had a history of the syndrome in the incipency. The prevalence rates of syndrome were 44.0% in dermatitis, 28.0% in conjunctivitis, 53.6% in rhinitis, 52.3% in bronchitis and 56.8% in gastroenteritis. In general, mucocutaneous syndrome except bronchitis gradually subsided or remained unchanged in the very long course of the disease. Only chronic bronchitis is progressive and respiratory tract seems to be easy to fall into infections. The most of the symptoms occurred in the second stage also gradually subsided or showed little change. In the late stage, such vascular lesions due to arteriosclerotic origin as myocardial infarction, cerebral infarction and gangrene in the limbs occurred. At the end of event, malignant neoplasms of various sites developed as the late effect of arsenic and the most conclusive factor for prognosis of the disease."



Symptoms of Bowen's disease (on the covered area) and solar keratosis (on the exposed area) in case of the skin, and are lung cancer and urothelial tumor in case of the internal organs. The reason why cancers are caused often on those parts is assumed that the skin and the lung were directly exposed to arsenic of high concentrations and the urinary organ was inevitably exposed at the time of excretion."

Many Incidences of Cancers on the Skin, Lung and Urinary Organs

The Department of Dermatology under the Faculty of Medicine of the University of Miyazaki has been examining the patients of Toroku at the request of Miyazaki Prefecture. The Department of Dermatology has published many papers on the issue. The paper titled "Cancer Incidences among the Patients of Chronic Arsenic Poisoning at Toroku" (Masahiro Idemori et al, *Skin Cancer* Vol. 14 No. 2, September 1999) reports: "Malignant tumors that are frequently observed among the certified patients of arsenic poisoning are Bowen's disease

Malignant Tumors among the Patients of Chronic Arsenic Poisoning at Toroku (as of October 1998)

	Bowen's Disease	Solar Keratosis	Lung Cancer	Urothelial Tumor	Others*
The Deceased (88)	39	11	17	4	12
Survivors (74)	12	4	0	0	2
Total (162)	51 (31.5%)	15 (9.2%)	17 (10.5%)	4 (2.5%)	14

*Others: Breast cancer, Uterine cancer, Gastric cancer (5 cases), Cancer of the appendix, Bile duct cancer (2 cases), Cancer of the maxillary sinus, Maxillary cancer, Malignant lymphoma, Angiosarcoma.

Testimonies of victims

Neither grass nor a single tree grew near the mine

'I was born in a place where fumes of arsenious acid fell. At that time the mountains surrounding the mine were stripped off grass and trees due to poisonous smoke. The environment around the refinery (or the *abiyaki* kiln) was always white as if it had frosted. Under such circumstances, people lived and went on working. Many of those who had been involved in the production of arsenious acid spitted blood and passed away in agony. One day a cattle of a nearby farmer climbed the wall up stimulated by pain with the throat so swollen to be suffocated, and fell down to die. It was miserable indeed.' (Late Hideo Tsuruno)



Late Shinzo Shimizu



Late Nakaji Sato

No one without experience would understand the hardships

'It was so hot inside the kiln chambers that you could not stay there more than five minutes. Once I entered the chambers with a hood, but the hood was burnt. I stopped wearing it and started putting a hat, a mask and a shirt on all the time in respect to summer or winter. Since arsenious acid powder fell down on the neck and to the back, I kept the shirt not tucked into the trousers. Arsenious acid powder affected the skin. Most vulnerable parts were inside the nose, the back of my neck, and the thighs. When badly affected, pimples appeared on the face and then scaled off. In such condition you cannot even touch your face. I used to press the nose gently with gauze. No one would really understand our hardships unless he had experience in *abiyaki*.' (Late Shinzo Shimizu)

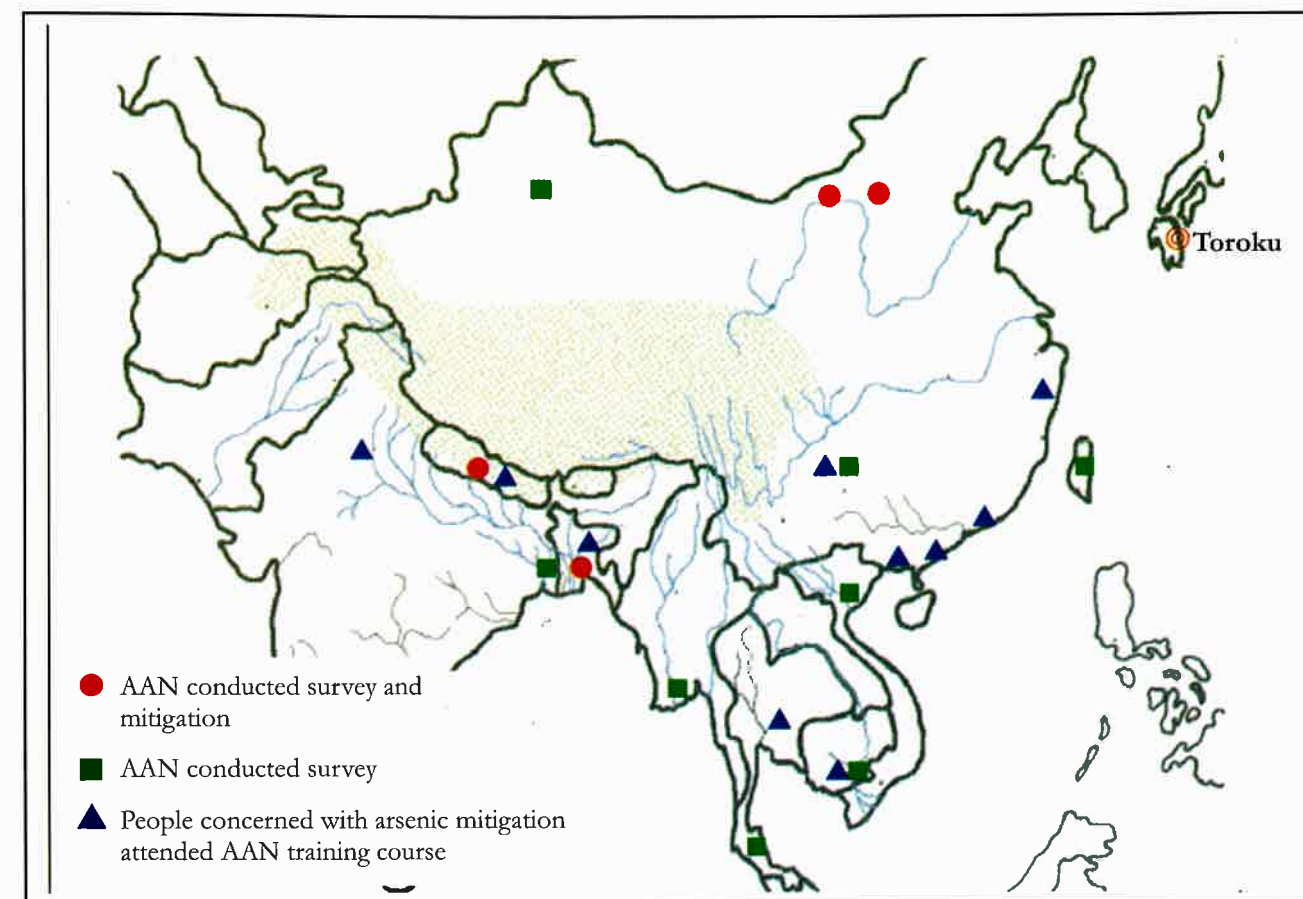
My children died one after another

'When the smoke came, my cattle coughed making a gurgling sound and shed blood from the nose. Our lemon tree in the garden withered up. Soybeans did not grow, and therefore I could not make miso (soybean paste) and soy sauce, or tofu either. My newly born babies died one after another. One child lived for three years but also died at the end. We lived in the smoke, which might have done nothing good.' (Late Harumi Sato)

Cancer: Hell on the earth

'We are suffering from all kinds of diseases on the respiratory, digestive, circulatory and urinary organs, the nerve, the eyes, the ears, the nose and whatnots. Cancer is the most dreadful disease most of all. My brother-in-law died of cancer of the larynx in August 1982. Suffering of cancer is like a hell in

this world. When pain started attacking him, he shouted that he wanted to jump out of the window of the hospital to die, which we had to hear aggravated by the fact that there was nothing we could do. There is no medicine to cure cancers. He died an awful death in agony like a snake half-killed. (Late Miki Sato)



Networking the Arsenic-affected Areas in Asia

The struggle of the Toroku patients got over a difficulty at the reconciliation by the Supreme Court. Later on, various information on arsenic contamination reached from other countries in Asia. In April 1994 the Asia Arsenic Network (AAN) was born from the Association to Support the Victims as its mother. The Articles of the Association of AAN notes down its objectives that it aims 'to share its knowledge and experience on arsenic incidents in Japan with victims

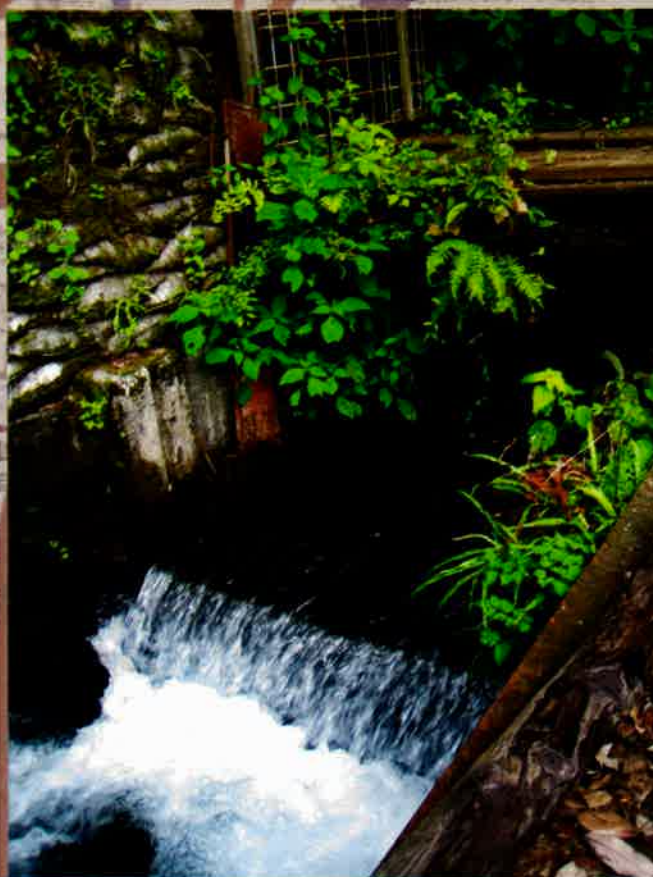
and experts in arsenic-affected areas in other Asian countries, to learn from each other, and to cooperate with a view to seeking the ways to solve each problem'. In the valleys of big rivers in China, Vietnam, Cambodia, Myanmar, Nepal, Bangladesh and India, the arsenic contamination in tube wells has become serious. AAN is actively promoting networking activities to connect people, experts and NGOs in those arsenic-affected areas, aiming at working together for mitigation through the exchanges of experiences on common issues such as the determination of the contamination mechanism, supply of safe drinking water, water quality test, treatment and monitoring of patients, awareness-building and the promotion of community participation.



Late Masashi Sato talks to a Chinese doctor

A wish of Toroku

Many people who are tackling arsenic contamination visit Toroku from various Asia countries. They take a field trip to the ruins of the mine and meet patients. They listen to what patients say: 'Please do not repeat the same sufferings as ours'. It is a wish of Toroku.



The water with arsenic still pours out of the mine (Photographed in August 2005)

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