Chapter 5: Science: Inversion of Environmental Knowledge in Japan

The tremendous power of the state is not always the prime determinant of inversion. Instead, it often hinges on the willingness of local people to accept the logic of the state. This acceptance is not merely due to the government’s arguments of the state being underpinned by scientific evidence, but also, when things are uncertain, people tend to rely on non-expert judgment to make decisions, even when it comes from non-local sources, to guide decision-making. To rediscover how to direct our knowledge toward serving the people’s interests, a better understanding of the workings of modern science is needed.

Ui Jun, a Japanese water engineer, fought passionately against the polluting companies and the scientists associated with them. His compelling story and incisive analysis provide insights into how environmental knowledge can invite inversion and, conversely, how this tendency might be reversed by relying more on the tacit knowledge of the people. This chapter begins by considering the tragic cases of Japan’s pollution in the 1960s and what they reveal about science and knowledge.

# 5.1 State Inaction in Environmental Problems

Japan has long experienced severe environmental problems—especially in the 1960s and 70s. However, even more remarkable than the severity of the pollution was the way that the socio-political system further exacerbated the damage. The risk of water pollution was identified as a potential threat to the health and economy of Japan as early as the 1940s (Terao 2009). While the notorious Minamata disease was first discovered in 1956, it took nine years for the government to acknowledge that it was caused by mercury-contaminated water emissions from Chisso’s Minamata factory. Even today, despite many years of effort from countless people and organizations, there are no reliable data on how many people have perished due to Minamata disease.

Minamata is not a disease of the past. It was in the year 2004 (more than 60 years after its initial discovery) that the Supreme Court ruled against the national and Kumamoto Prefectural Government for negligence in allowing the spread of mercury poisoning near the Shiranui Sea in western Japan (Yoshinaga and McCormack, 2004). The Japanese Ministry of the Environment reported that out of 35,092 applications, only 2998 were newly acknowledged during the 2009–2012 special relief scheme established by law (Ministry of the Environment 2020).

The most recent decision on Minamata was handed down in September 2023. In this case, the Osaka District Court ordered that the central government, Kumamoto Prefectural Government and chemical manufacturer Chisso Corporation pay damages to the plaintiffs from 13 prefectures who were excluded from a special relief program for those with Minamata disease. While the medical cases have been decreasing naturally due to aging, the institutional battle continues.

Figure 5.1 Number of Applicants for Minamata Disease Victim Identification

Source: Ministry of the Environment (Japan)

In the preface of this book, I defined “inversion” as a process initiated by an environmental policy, whereby potential local collaborators turn into adversaries, precipitating relationships that damage the very objective of that policy. While compensation for Minamata victims is not an environmental policy in the strict sense, it is still an effort to ameliorate the harm caused by environmental pollution.

US-trained sociologist Tsurumi Kazuko (1918–2006), who conducted five years of fieldwork in Minamata in the late 1970s, noticed the divisions in the local communities due to the distance and benefits they get from Chisso company, but also documented the conflicts caused by the compensation provided by the government to aid acknowledged victims. She observed that “…due to the pollution of the Shiranui sea, fishermen people can no longer live there without compensation [either] for fisheries or as a certified Minamata disease victim. However, the indemnity money created conflicts among the local people” (Tsurumi 1998; author translation).

Tsurumi’s work also demonstrates that conflicts have occurred not only between those officially certified and those who were not but also between those certified early versus those certified late. Materially, this conflict manifested itself in how people were rendered able to survive only by depending on support provided by the state. The very community that functioned as a buffer to such external shocks is now destroyed—less by the pollution itself than by the way the indemnity was provided. This is one type of inversion where policy does not consider the fact that human relations can be damaged by pollution as well as the distribution of the money intended to solve the problem.

The failure of various levels of government in the late 1950s and early 1960s may not be surprising. At that time, Japan was an archetypal developmental state. However, inversion occurred as the government attempted to seek policies to resolve environmental problems through monetary compensation. The effects of state policies and their unintended consequences have been shaped by the victims’ responses.

# 5.2 *Kōgai Genron* (Principles of Pollution)

While a nation-state is modernizing, the government often colludes with larger private companies, which are the major drivers of economic growth. However, the Japanese pollution problem, which emerged most intensely in the 1960s, was not merely a case of a dilemma between development and the environment during a period of state-led rapid economic growth.**[[1]](#footnote-1)** Ui Jun was a unique researcher who sacrificed his promotion at the university to challenge the existing power structure, questioning the very ways in which pollution issues were taken up.

In the 1950s and 1960s, when pollution was just beginning to be recognized more broadly as a social issue, Japan was in the midst of a period of rapid economic growth that would later be described by the world media as a “miracle.” At this time, there was a strong tendency to accept pollution as a “strain of rapid economic growth.” By beginning his research from the perspective of Minamata disease victims, Ui began to question the role of researchers and universities not only in justifying but actively mystifying the true cause of pollution. Observing that those on the industry side were rationalizing pollution as an unavoidable side effect of economic development, Ui counterargued that “ignoring pollution was a factor that allowed rapid economic growth” (Ui 1971, 225).

Though based at the politically powerful University of Tokyo, Ui remained an “assistant” (*joshu*) for more than 20 years. Not entitled to offer official courses, he began an unofficial “voluntary course,” offered in the evenings and open to the general public. This made him famous despite his low status in the otherwise privileged Faculty of Engineering. Titled *Kōgai Genron*" (Principles of Pollution), the unofficial lecture series started in 1970 and continued for 15 years, attracting more than 1,000 people at times, from student movement leaders and activists to actual victims of pollution. This group became a driving hub of the subsequent pollution movement in Japan. From the perspective of the senior professors and executives of the University of Tokyo, which Ui had criticized as “a group of governmental scholars,” his voluntary lectures must have seemed like a guerilla-like rebellion. His opening remarks at the first session illustrate his stance on power and hierarchy in the scientific community:

In the case of pollution, the university and the college are the most important complicit actors. In each pollution case, the university and its graduates almost always help worsen the pollution. Typical of this is the University of Tokyo. If we treat this university as an example of how a national university, provided with budget and buildings by the state and established to educate people for national service, has become an instrument of oppression and discrimination against the people who support the state, the opposite example is the University of Warsaw, which was secretly and continuously built as a base of resistance. Studying there was an act of risking one’s life and did not bring any privileges. To study for the necessity of survival and not simply to promote oneself is the whole point of [the course] Principles of Pollution (Ui 1971, 2; author translation).

Much has already been written in Japanese about Ui’s legacy, and I am not in a position to evaluate Ui’s achievements as a water engineer or as an elucidator of Minamata disease.[[2]](#footnote-2) I would rather focus here on the stratification of knowledge, which Ui repeatedly emphasized as the root cause of pollution issues.

The core problem of knowledge and power will become ever more poignant as the state consolidates its dominance as the central entity to “solving” climate and environmental problems. Besides, it is the culture of academia—which regards certain knowledge as valuable and disregards others as insignificant—that causes interventions that are supposed to be helpful to people but so often invert and bind them instead.

[Insert photo of Ui Jun giving a final lecture at the University of Tokyo]

## The Class System of Knowledge and the “Neutral” Third Party

Ui was a bitter critic of Japanese elite society, especially its culture of education and research, which had constantly relied on “theories thought up by others” based on the existence of “precedents.” He saw the University of Tokyo as sitting at the apex of this system.

There are three major aspects of “Principles of Pollution” through which Ui tried to challenge the existing hierarchy of knowledge. The first is that Ui regarded pollution in Japan as an intellectual opportunity for Japanese people to confront a problem, the damage of which could be seen just by observing, and to address it on their own terms rather than through imported intellectual tools. It was, in his eyes, “a challenge that Japan truly should welcome” (Ui 1971, 232). Ui’s endeavor held the potential to fundamentally challenge the prevalent decision-making culture, which seemed to evade responsibility whenever a disaster struck by labeling the events as “unprecedented.” Japan has experienced frequent disasters and has come to understand firsthand the dangers of relying on “precedent.” This includes the notorious Fukushima nuclear accident. Such a high frequency of unpredictable disasters demands a different kind of mindset from the one centered on the stable and more predictable trajectory of economic growth.

Second, Ui describes the pollution movement as “the story of a losing battle” (Ui 1971, 231) but posits that the experience of losing is a more beneficial learning opportunity for Japan as well as other countries. Japan’s accumulated negative experiences of ostensibly failed civil movements provide a useful reference point for developing countries today, where the dilemma between development and the environment is as acute as it was in Japan during its period of rapid economic growth.

The third is Ui’s experience of challenging those in power who wield great scientific knowledge while keeping his work true to the experience of the victims. Ui believed that the general public, including the victims of pollution, possessed experiences that should be respected. Ui described the characteristic of victims’ systemic and comprehensive awareness as “inexpressible.” This is what Michael Polanyi called “tacit knowing” (Polanyi 1966). Polanyi suggested that *formal* knowledge, which can be put into words, is only a small part of our total knowledge; in contrast, “we can know more than we can tell” (Polanyi 1966). What is important here is not that such tacit knowledge exists, but the arbitrariness of elevating one form of knowledge as superior while marginalizing the other—a key issue that Ui found problematic.

Disregarding what Ui calls “inexpressive experiential awareness” (Ui 2000: xx) makes it difficult to treat victims’ voices fairly within the conventional framework of benefit/suffering. More importantly, it also wastes knowledge and skills that are potentially useful in addressing real-world problems on the ground. In today’s world, where modern scientific thinking has become dominant, tacit knowledge seems to be increasingly devalued. Between privileged formal knowledge and tacit knowledge lies a disparity that could be called a “class system of knowledge.”

Ui’s battle with the establishment led him to the proposition that “there is no such thing as a third party to a pollution problem.” According to Ui, anybody or any organization claiming to be a “third party” will necessarily take the side of the perpetrator, regardless of their intentions.[[3]](#footnote-3) This is because the “problem” cannot be defined based on objective data—instead, it is the implicit framing of the problem that dictates what *becomes* the data. The following observation summarizes Ui’s articulation of the problem:

When damage is perceived, the victim feels it with their whole body. Objectifying such experience so that it can be communicated to others in words is not an easy task, and in many cases, the victims cannot adequately express it. The victims’ perception of pollution is thus more systemic and comprehensive. In contrast, the perpetrator’s perspective—limited to quantifiable aspects such as the concentration of pollutants or the number of victims—is at best partial. […] If there is someone who claims to be an impartial third party and tries to hear both sides equally, the perception falls somewhere between partial and total and will inevitably take on the side of the perpetrator (Ui 2000, 51).

Ui pointed out that the “governance of knowledge” lies in the very way we understand pollution prior to our action towards addressing pollution. We know that local knowledge, despite its practical strength backed by a contextual understanding of the problem, has been overlooked and silenced in many situations by theoretical knowledge, which seems to be applicable regardless of the specific location or context.[[4]](#footnote-4)

## How things could be done differently

The “governance of knowledge”—the process by which particular knowledge acquires legitimacy—is a process that consolidates the class system of knowledge. Looking back on the history of the twentieth and early twenty-first centuries, the governance of knowledge has developed with a bias toward formal scientific knowledge. However, there was once a time when tacit knowledge was given equal status to formal knowledge.

Aristotle classified knowledge into three categories: episteme (true knowledge, science), techne (knowledge of craft and art), and phronesis (knowledge of doing, ethics and prudence). Among these, “science” refers to that which can be taught by others and is invariable in time and space. While science is in the domain of knowledge that finally converges to one universal answer, the other two belong to the domain of tacit knowledge, in which different ways of being are possible without convergence toward a single best way. Techne is the “craft involved in making things happen,” which we call “technology” today. The other category is that of knowledge of action and practice, the focus of this chapter, which Aristotle called “phronesis” (Aristotle 1954: pp).[[5]](#footnote-5) While the first two types of knowledge have developed to the present day as “science” and “technology,” respectively, phronesis—often translated as ethics or practical knowledge—has not developed a coherent successor concept (Flyvbjerg 2001)[[6]](#footnote-6) and has remained almost stagnant since the early decades of the twentieth century.

What are the major characteristics of tacit knowledge? The first is its integrative nature for practical purposes. Formal science divides the object of observation into parts for analytical purposes. The results of its analyses are usually limited to findings on statistical trends and correlations based on the selective observation of samples. In solving real-world problems, however, integration is a precondition for usefulness. Integration draws on tacit knowledge to intuitively grasp the individual situation at a particular place and time. In the case of agriculture, for example, crops grow well only when specific local knowledge about the soil, climate, and crops themselves are integrated toward the goal of cultivation.

The second characteristic is that implicit knowledge is learned and acquired through one’s own experience. Even those who know how to do everyday activities such as cooking or riding a bicycle, or a more professional practice such as agriculture and medical practice, may be unable to explain how they managed to perform them.

A third characteristic is its orientation toward local-specific contexts and individual cases. Whereas universal formal knowledge discards context, tacit knowledge produces practical effects *through* its ability to capture context and situation. Because of this characteristic, Aristotle says, “those who do not possess knowledge are more useful in practice than those who do” (Aristotle 1954, 146). The following example is illustrative:

…for if a man knew that light meats are digestible and wholesome, but did not know which sorts of meat are light, he would not produce health, but the man who knows that chicken is wholesome is likely to produce health (Aristotle 1954, 146).

The knowledge that chicken is healthier is indeed particular. Aristotle adds the example of a doctor who errs in treating a patient: “If then, one were to have a theoretical account of the immediate particular, knowing the universal but being ignorant of the immediate particular, he will often err in his treatment. For it is the particular that must be treated” (Aristotle 2004: 5). We know that in such everyday practice settings, it is essential to have the ability to read the unique context that conditions the scene.

Tacit knowledge with these characteristics has been neglected and discarded in the process of modernization, partly because, unlike formal scientific knowledge, it has characteristics that are difficult to record. It is also because the integrative, individual contextual, and practical characteristics of tacit knowledge reject three of the most essential criteria of modern science: universality, logical consistency, and objectivity (Nakamura 1992). No matter how comprehensive and dense a personal experience may be, from the perspective of aggregation, each case based on unique experiences is at best a single data point and at worst “noise” that gets in the way of estimating the experience of the whole population.

On the other hand, we know that the knowledge of the people who live onsite is indispensable for the management of local resources such as forests, land, water, and fish. Considering that the natural environment is an object of practice and a place of experience, this raises questions regarding the extent to which we can rely solely on science, which has developed by downplaying individual contexts. To answer this question, it is not enough to simply criticize science. We must envision a different kind of knowledge that complements it. As the debate on climate change and geo-environmental science escalates, disciplines that seek to capture local specificity are increasingly needed.

In the Minamata case, an experiment was conducted to see whether Minamata-like symptoms would occur in cats injected with wastewater from the factory. On July 21, 1959, a medical doctor of Chisso Hospital, Dr. Hosokawa Hajime, confirmed that “Cat No. 400” exhibited the same symptoms. However, Dr. Hosokawa, upon consultation with factory management, decided not to disclose this information on the basis that it was “only one sample,” which is not enough to claim scientific validity (Kobayashi 2021, 73).

Leaving aside the probable factor of self-interest among the Chisso employees, it is important to acknowledge the deployment of science to justify the dismissal of the information. Data that does not have a large enough sample size (the N-number) is a well-established scientific principle, but its application could justify discarding any results or—what should have happened but did not—it could justify postponing any policy judgment until “enough cases” became available (Matsubara 2000, 191). The critical question is whether the appropriate incentive existed to increase the sample size.[[7]](#footnote-7)

The issue of tacit knowledge not only prompts reflection on the science we have relied on as a way to understand environmental issues but also leads us to more advanced questions on the structure of the state. Modern science was the intellectual foundation of the developmental state and has now been inherited as the foundation of the environmental state. If “environmental problems have emerged as a result of the contradictions of modern science” (Torigoe 1989, 18), then it is important to examine the process by which scientific knowledge is privileged within the environmental state.

# 5.3 The Politics of Knowledge

## The Privilege of Scientific Knowledge

Throughout history, political judgments and governance in many countries have relied on highly personal tacit knowledge, such as the intuition and connections of a limited number of rulers (Berlin 1996). The process of democratization has sought to invite as many people as possible into decision-making. Conversely, the ruling class must have perceived the very diverse and difficult-to-grasp tacit knowledge among the governed as a threat to their power. Understanding the processes that transform experience into data is an important strategy for preventing the inversion of environmental states that use scientific data as justification for their action.[[8]](#footnote-8)

James C. Scott discussed the harm done by viewing matters in the same way as a state, with the tendency to marginalize local knowledge (Scott 1998). Scott described the process of shaping reality through various simplification procedures allowing the central government to operate from a distance. Focusing on the process by which the idea of modernization explicitly and legibly transformed the objects of governance, Scott drew on such materials as the household registration system, language, weights and measures, and property rights to illustrate the process by which rural and urban spaces were made subjects of state control (Scott 1998). As it became possible to gather and manipulate information from across the country from the comfort of offices in the capital, local knowledge was reduced in status and overwritten by legible uniformity.[[9]](#footnote-9) In the Asian context, slash-and-burn cultivation is extremely “illegible” from the perspective of the government, which often results in its prohibition in the legal system.

The current and projected status of vegetation and yields according to the land are aggregated into a stylized table, and the “success” of governance becomes measurable in terms of differences in expected yields. Through these representations, the “forest” becomes a reality in the minds of the rulers for the first time. The quantification of forests as converging yields and revenues was useful in explicitly targeting barriers to governance, such as fire, pests, and grazing by local people (Agrawal 2005, 59), but it also permanently rendered the forests objects of government manipulation. In other words, it made them governable.

The new governability of forests and other resources entailed a twofold replacement. First, the traditional view of forests was replaced by a statistical one; and second, the concept of subsistence cultivation of the land and the like, which had no commercial value, was seriously devalued and replaced by commodity-oriented activities and lifestyles (Agrawal 2005, 34). The new technology of statistics redefined forests. From a broader perspective, this rationalization was also a process of removing one of the elements of tacit knowledge: individuality.

The neglect of tacit knowledge can be mitigated by efforts to formalize tacit knowledge. However, we should not overlook the possibility that those who do not want their tacit knowledge to be legible may resist. The history of governance is the history of deception between rulers and the ruled (Sato 2016). Scott describes how people living in the mountains away from the centers of civilization in the Southeast Asian region were not relics of barbaric natives but rather those who chose to live in a *post*-civilization world (Scott 2009). Along with physical distances, mountain people have discarded their writing, the very foundation of formal knowledge in our civilization. If writing and record keeping were central to state control—in the form of conscription and taxation— abandoning such a system could be seen as a means to resist state power.[[10]](#footnote-10)

## The “Technological Advantage” that Neutralizes Experience

As noted above, centralized government favors the transformation of governed “resources” into a standardized and manipulable object. This transformation is spurred on by the increasingly dogmatic principles of efficiency. Efficiency in economics aims toward a concept known as “Pareto efficiency,” where no change to the allocation of any resource can make any individual better off without making another worse off—in short, when there is no waste in resource allocation. The strength of the efficiency logic is that “everyone benefits” and distracts us from political disputes over distribution. Even if unfair distribution arouses discontent, it can be argued that the reduction of waste can make way for a later redistribution that will produce the most aggregate satisfaction.

The logic of efficiency has a strong affinity with scientific knowledge, which is oriented toward universality. Hence, the logic of efficiency relegates the process of individual struggle to the background in the process of reducing waste. This absolute legitimacy of the principle of efficiency has the effect of shutting off the search for individual experience as the basis of choice (Torigoe 1989), also foreclosing discussion on how costs and benefits could be allocated differently. Efficiency avoids the issue of value judgment by distracting us from context, making us obsessed with the means to achieve maximum benefit for the least effort.

The strict application of the principle of efficiency tends to favor ecological modernization through the search for better technology. Ecological modernization is based on the idea that modernization and technological progress can overcome various environmental problems (Korhonen 2008). This modernization is not craft or art in the sense Aristotle intended or used. And it is even further from phronesis, virtually forgetting the purpose of the intervention in the first place. Technology is applied purely for scientific “efficiency”—making the largest pie with the least waste. As Winner puts it,

It is characteristic of societies based on large, complex technological systems, however, that moral reasons other than those of practical necessity appear increasingly obsolete, “idealistic,” and irrelevant. Whatever claims one may wish to make on behalf of liberty, justice, or equality can be immediately neutralized when confronted with arguments to the effect: “Fine, but that’s no way to run a railroad” (or steel mill, or airline, or communications system, and so on) (Winner 1980, 133).

This unassailable logic of efficiency and narrow view of technology makes examining the human experience preceding any particular choice difficult and shuts off the imagination toward alternatives. Realizing this, I see great potential for social science in exploring other paths that could have been taken in history but fell under the domination of a seeming technical inevitability. Governance has long involved a process of taming the subject, justified by the logic of scientific efficiency. Rediscovering the values of diversity and uniqueness lost in this process may even signal new directions for different ways of being.

The concept of efficiency is a logic that prioritizes the function of the entire system based on the relationship between means and ends. In other words, it is also a logic that considers the sacrifice of the few to be unavoidable. Ui formulates this problem as a conflict between “a very small convenience for a large number of people and a very large disadvantage for a small number of people” (Ui 2000: xx). Of course, the nature of the advantages and disadvantages will change over time. However, it is a fact that we have become accustomed to the idea of prioritizing “convenience for the many” as the logic of government.

## The hedgehog and the fox

“The fox knows many things, but the hedgehog knows only one big thing.” The British political philosopher Isaiah Berlin (1909–1997), quoting this poem by the ancient Greek poet Archilochus, divided authors into two categories: those fascinated by examining a plethora of very small things; and those who attempt to relate everything to grand overarching theories.

Looking at the behavior of the environmental state, it appears as though the central government acts as a hedgehog, setting the policy direction for a myriad of foxes, the people, who have an immense range and diversity of local knowledge depending on their locations, relations and interactions with others. The government, due to the nature of the scientific advice it receives, has a tendency to take full control of the process of resource allocations, hazardous materials, and so on. This path toward centralization grants the state a powerful authority, which, if left unchecked, can become irreversible.

The knowledge that sprouted in the era of modernization and flourished in the developmental state was a formal kind of knowledge, made valuable by becoming impersonal. This was inherited by the environmental state with the idea that by using science and manuals, resources and the environment can be managed. However, the effects of this approach are manifested in different ways than in the developmental state.

Formalization has progressed in a way that leaves important matters to experts to identify problems and solutions. The effect, however, has been the empowerment of the state to select specific experts and scientific findings. It governs the people partly through the governance of knowledge. As we have already pointed out, this does not mean that civil society, NGOs, and others who resist are powerless. However, few nongovernmental organizations oppose environmental protection itself. Resistance to the state, especially in the environmental field, has been virtually subsumed into the state.[[11]](#footnote-11)

If we replace the conflict with the axis of “those who govern” and “those who are governed,” we find a deeper problem in the relationship between the two than the coexistence of the two intelligences: the forgetfulness of people. If we forget the issue entirely, the debate between scientific vs. tacit knowledge loses its relevance, and knowledge becomes stratified.

# 5.4 Four Stages of Problematization and Forgetting

Up to this point, the discussion has assumed that knowledge is always there, waiting to be used. However, a major factor that makes environmental issues a governance challenge is our habit of neglecting the lessons of the past, even when they are available.

Everyday environmental risks, like air pollution in major cities such as Beijing, are more easily recognized as “problems” than natural disasters that occur once in a thousand years. Conversely, the less frequently they occur, the more people forget their existence and pain. In the longer frame of evolutionary history, the ability to forget traumatic experiences has been a great strength for humans.[[12]](#footnote-12) This remains the case to the extent that any individual cannot influence their social or material environment. However, it becomes a weakness if we fail to apply the lessons learned from past calamities in an age when humans can— especially collectively—shape our environment.

Despite all the efforts to learn the lessons from the experience of pollution through textbooks, museums, documentary films, and story-telling to the site visitors, the problem of acknowledging the victims remains today. Moreover, new issues of water pollution continue to be discovered, including carcinogenic chemicals such as **PFOS and PFOA that can impact human health in significant ways (Tang et al. 2023).**

Scientific knowledge of the warning signs of disasters has improved, and the accuracy of predicting the time between an earthquake and a tsunami has increased dramatically. However, the degree to which human society, the recipient of such information, has advanced is another matter, and in this sense, the risk of natural disasters exists only as a probability. While science serves as a helpful reminder of past experiences, it can also be a source of complication when relied upon to attribute responsibilities and compensation in the aftermath of such disasters.

It is not merely the limitations of human memory or lack of ability to record that drives past lessons into oblivion. There are many cases in which experts have actively “helped” people to forget. Ui, reflecting on his own experience of dealing with pollution problems, sums up the common path in almost all incidences of pollution. The story goes like this: when pollution is discovered and its cause is about to be found, a “neutral third party” appears who claims that “the real cause exists elsewhere,” which leads to the true cause being lost in the maze and the problem itself being forgotten. The important point here is that the forgetting of past lessons does not always stem from poor human memory of things but is often actively and consciously discouraged.

In each time period, certain people have foresight and are one step ahead of the times. This does not mean that the findings of such people are reflected in policy, or that their findings are empirically valid. Historically, however, the majority of so-called environmental damage has been caused by too much time between discovery and action. Yet, the problem was perceived clearly by some. The question of how to shorten the time between the discovery of a problem by people (many of whom are vulnerable and must bear the risk in the first place) and the action by those who have the power to solve it is no less important than developing technologies to reduce environmental risks themselves.

# 5.5 Lessons from *Kogai Genron*

## Changing the Direction of Learning

It has been a long time since tacit knowledge has been given its proper place in academic discourse, even though it has a wider base of practical utility than formal scientific knowledge. What lessons can “Kōgai Genron” teach us about restoring the status of tacit knowledge and responding to individual environmental problems, especially as we confront the environmental state?

The first is to shift the overarching focus of academia away from merely reproducing individual sciences to becoming a more problem-oriented endeavor. Ui reminds us that the stratification of knowledge was not a sudden creation by those in elected or bureaucratic positions in government. The whole of society, and particularly the education system, is connected, and the knowledge that the government draws upon is provided by universities. The fragmentation of knowledge, starting in the academy, is one cause of inversion. Problem-oriented knowledge—or problem-discovery-oriented—to be more precise, can be evaluated not in terms of the number of scientific papers published in prestigious journals but in terms of its concrete contribution to the diagnosis and solutions to real-world problems.[[13]](#footnote-13) However, we also know that much of the “problem-oriented research” overwrites what has been identified as “problems” which tend to serve the industry that already has solutions to offer. It is thus essential to ensure that such problem-oriented knowledge is not restricted to the resolution of technical problems. Practical wisdom is also needed, as is consideration of the vulnerable groups that suffer the most. To guide academia toward such issues, we need to look at modifying the entire reward system in academia.

Second, we must actively recognize the domain of tacit knowledge and establish institutions that support its representation, communication, and utilization (Meisch et al. 2022). Since tacit knowledge is knowledge inherent in individuals, it is difficult to reproduce it systematically in the form of written manuals. Tacit knowledge can be strengthened by establishing a connecting platform. For example, “crowd-sourced knowledge,” in which a specific problem is posed on the Internet and knowledge useful for solving the problem is gathered from all angles, has the potential to solidify the knowledge of the weak, which includes tacit knowledge in a new form of solidarity, even though it contains noise. Its usage seems particularly well-suited to rural villages in developing countries, where the usage of smartphones is rapidly increasing.

The third is to break the monopoly of scientific knowledge and promote the value of tacit knowledge. This will include preventing techne (technology) from growing out of control (Tsukamoto 2008). It is also valuable to recognize a role for people who appreciate the value of both tacit and formal scientific knowledge and can bridge the gap between the two because tacit knowledge provides meaning to scientific knowledge in a particular context (Mitchell, Harvey and Wood 2022). Ui points out the “irony that the universalization of pollution has resulted in the breaking of the monopoly of knowledge” (Ui 2000, 65). He notes the example of the 1996 Suginami disease, which was caused by exposure to emissions from a waste processing plant. One of the victims happened to be an expert in plastic material and could identify the cause on the spot. Social science could study how such dormant knowledge could be discovered and utilized at the right time.

## Transforming science into empathetic knowledge

In a world of increasing uncertainty, what form of knowledge is useful in addressing environmental issues? As we look into the history of the collusion and exploitation of academia by those in power, we can learn much from Ui’s struggle to empower people without a voice. We need to question the role of the university in supporting the government—or increasingly, the market economy—to provide scientific “solutions.”

Looking back on his battles against the political power that invited inaction and inversion in various forms, Ui draws attention to the failure of his studies to secure his promotion at the University of Tokyo. He remained “almost a faculty member” for twenty years, despite his enormous contributions that helped to bridge science and tacit knowledge while also skillfully communicating episteme, phronesis, and perhaps a broader sense of techne with members of the public.

If you remove the privileges and promotional opportunities associated with what the university offers, what remains? Pertaining to pollution, we come to the realization that not much has been done to limit the activities of polluters, such as technical measures to reduce pollution or develop alternative measures. The victims of pollution have fought and sometimes lost their battles, while in other cases, they have won, leading to a common understanding of the progress that has been achieved in the century-long history of pollution. […] This collective experience can provide a new basis for scholarly discipline in our universities (Ui 1971, 9; author translation).

Historically, systematized formal knowledge has been privileged and has gradually neutralized alternative ways of knowing. We have taken up the concepts of efficiency and ecological modernization, which at first glance seem to have nothing to do with politics. Both take “governance” as their starting point, but if the status quo is the result of the accumulation of vested interests, then it is only natural that academia will become a “discipline for the powerful” (Ui 2014, 318). In his unfinished theory of pollution, Ui was probably ultimately aiming for a direction of study that serves the vulnerable.

To restore tacit knowledge, it is necessary to transform academia into a problem-oriented endeavor. To do this, it is necessary to have the knowledge and vocabulary to criticize arguments that neutralize tacit knowledge. The belief in the superiority of formal knowledge has made the value of tacit knowledge difficult to see. Yet tacit knowledge is not inferior. A good doctor can look at the needs of the patient in front of them either as data that fits a model, or they can look at the unique characteristics of that patient. The doctor as a researcher is valued for their accumulation of formal knowledge about human beings in general, but this should not lead to the neglect of the tacit knowledge of the doctor as a healer.

Formal scientific knowledge has indeed shone a bright analytical light on many aspects of environmental issues and has aided our understanding. But as we saw in Chapter 1, science does not tell us what to measure or analyze in the first place or how to weigh assumptions and results as a society. These processes call for judgment, a form of wisdom. Even if science helps us make judgments, and technology provides the means to act on those judgments feasible, the need to explore the judgment and “different ways of being” is no less of an imperative. We need to further explore the nature of judgments themselves and how experience is taken up both before and after it becomes data.

The environmental state does not exist independently but is supported by specific intellectual endeavors, which encompass government, industry, academia, and civil society in general. To generate the environmental state itself, rather than individual policies and organizations, the issue of the stratification of knowledge, which Ui raised, must be placed back on the table for discussion. Drawing on Ui’s example, social scientists must work to recognize the importance of knowledge that cannot be captured by formal knowledge. Social science has the important function of envisaging how things can be done differently, a local alternative to top-down scenarios that can invoke inversions.

Considering that the majority of the people who run the environmental state are also educated at institutions of higher learning, universities have a responsibility to protect, rather than exclude, problem-oriented and experience-based research that has not rewarded researchers. The movement toward directing knowledge to the everyday problems of the people, rather than producing more papers for scientific rewards, germinated in Japan during the era of economic growth but never fully blossomed. It is this lost art that we need to rediscover in the coming era of the environmental state.

1. When conflicts of this type erupt between businesses and people, it is usually clear where the state’s interests lie, especially in contexts where growth and profit motives dominate. First and foremost, the state is motivated by the desire to keep high-profile disputes from erupting. [↑](#footnote-ref-1)
2. For more details on Ui’s life and thoughts, see Ui (2008), compiled by his students and others. [↑](#footnote-ref-2)
3. See especially Funabashi (2007) for a critical examination of the issues surrounding the concept of a “third party” discussed in this chapter. [↑](#footnote-ref-3)
4. Fujigaki Yuko, a renowned science and technology expert, points out that “in the social theory of science and technology, the knowledge of local residents is always discussed in comparison with the knowledge of experts in science and technology, whereas in environmental sociology, the contrast is rarely brought to the fore, and the knowledge of local residents is overwhelmingly regarded as reliable and legitimate” (Fujigaki 2004, 26). This point should serve as a wake-up call against the uncritical glorification of local knowledge. [↑](#footnote-ref-4)
5. Flyvbjerg (2001), who continues Aristotle's argument, aroused controversy among positivist researchers by arguing that the social sciences should actively address the issue of value to improve context-specific judgments, rather than aiming for universal laws like the natural sciences. For these debates, see [Schram](https://www.amazon.com/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=Sanford+F.+Schram&text=Sanford+F.+Schram&sort=relevancerank&search-alias=books) and [Caterino](https://www.amazon.com/s/ref=dp_byline_sr_book_2?ie=UTF8&field-author=Brian+Caterino&text=Brian+Caterino&sort=relevancerank&search-alias=books) (2006). [↑](#footnote-ref-5)
6. Tacit knowing and phronesis are not necessarily the same. The former emphasizes observation on the input of knowledge, while the latter focuses on the outcome of knowledge. However, they share a common understanding regarding the subject of tacit dimensions that is difficult to articulate. [↑](#footnote-ref-6)
7. In the classic work on *Decision Analysis*, Raiffa formulated the issue as the “Error of the Fourth Kind”—that is, “solving the right problem too late” (Raiffa 1968,xx). [↑](#footnote-ref-7)
8. I would like to thank Dr. Satoru Matsumoto for suggesting this line of discussion. [↑](#footnote-ref-8)
9. In some cases, people have not always silently accepted standardization from above. For example, as late as the 1920s, the “window and door tax” (a system of taxation based on the number of windows and doors) remained in effect in France to facilitate tax collection. However, it inadvertently prompted a strategy of resistance by encouraging people to reduce the number of windows and doors in their buildings (Scott 1998, 47–48). [↑](#footnote-ref-9)
10. Slash-and-burn mobile cultivation, which is frowned upon by the government in terms of taxation and difficulty in understanding demographics, can also be seen as a strategy of resistance by frontier peoples against rule by a central government that has encroached into the backcountry while relying on formal knowledge (Li 1999). [↑](#footnote-ref-10)
11. Relevant here is the Austrian economist Friedrich Hayek (1899–1992), who pointed out that “the scientific knowledge known to experts is only a small part of the sum of all knowledge.” More than half a century ago in his essay, “The Use of Knowledge in Society,” Hayek argued that the advantage of a liberal capitalist economy over a socialist planned economy is that the former is better able to capture “knowledge of a particular circumstance of time and place” through information-intensive “prices” (Hayek 1945, 521). However, for society to tap into such knowledge and utilize it as a whole, Hayek pointed out that the “man on the spot” must be given appropriate discretionary authority, rather than someone making all the plans centrally. On this basis that Hayek argued for the superiority of market mechanisms over a planned economy. [↑](#footnote-ref-11)
12. After witnessing the Sanriku tsunami of 1933, physicist Torahiko Terada (1878–1935) asked why human preparations for tsunamis have always come too late. He pointed out that the answer was forgetfulness, referring to it as “a natural phenomenon in the human world” (Terada 1933). The Sanriku tsunami that claimed 3,000 dead or missing victims was only 37 years after the Sanriku tsunami of June 15, 1896, which killed over 20,000 people. Even this short period was enough for humans to forget the pain of past disasters, and people have returned to live in coastal areas for convenience. [↑](#footnote-ref-12)
13. Of course, there is a possibility that an overemphasis on practical studies may jeopardize basic research. [↑](#footnote-ref-13)