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Megaprojects and Social and Environmental Changes: The Case of the Thai "Water Grid"

Large-scale development of irrigation has long been an attractive option of postwar development, and the Mekong region has been no exception. Thailand has developed approximately four million hectares of irrigated land, and its northeastern region (*Isaan*)—both the driest and poorest part of the country—has been the target of many water projects. However, "full development" of its potential has been constrained by the lack of storage sites and the difficulty of diverting water from the Mekong River. Several ambitious projects have been discussed during the last 50 y, all of which have been aimed at "greening *Isaan*." In 2003, the Thai administration launched the idea of a national "water grid" that would triple the area of irrigated land in the country. This paper analyzes the emergence of this megaproject, its governance, and its economic and environmental soundness.

INTRODUCTION

Water-resources development has long been a favorite option of governments seeking to ensure national food security, alleviate poverty, control potential social unrest, and procure political gains (1, 2). The development of water-hydraulic infrastructures and irrigated areas in the period 1950–1980 has achieved many benefits, including increased incomes, yields, and production, and achievement of a global food sufficiency that is reflected in the long-term decline of grain prices (3). Because of declining benefit/cost ratios and, perhaps, the very successes achieved in terms of food production, such projects have lost their economic appeal, and funding by lead development banks has dramatically dropped (4). This trend has also been fueled by the major social and environmental impacts that have surfaced in the course of time and by the resulting opposition to dams that these changes have triggered in return.

Despite these recent trends, much environmental change is still being brought about by large-scale projects that profoundly shape landscapes and waterscapes: industrial large-scale plantations, large hydropower dams, and interbasin diversions, for example, are still being planned and implemented. The distribution of benefits and costs of these megaprojects and the evaluation of their environmental impacts remain a subject of deep concern (5, 6). There are indications that the convergence of interests among governments, local politicians, consultants, construction firms, and development banks is so strong that the old self-serving paradigm of development as an injection of capital and technology remains pervasive. In the field of water-resource development, this has been shown to lead to the overdevelopment of river basins (7).

This paper examines the genesis of a project to develop irrigation in Thailand, in particular, in its poorer and drier northeastern region (*Isaan*), on an unprecedented scale. In 2003, the administration of prime minister at the time, Thaksin Shinawatra, launched the idea of investing USD 5 thousand million in a project dubbed a "water grid," which was supposed to do away with water problems in the country and to increase irrigated areas threefold. In late 2005, the government announced that it planned to spend up to USD 43 thousand million over 5 y and embarked in the promotion of megaprojects aimed at boosting activity and reducing poverty, including investments in the irrigation sector (8). This paper addresses the decision-making process, the rationale, and the systemic consequences of the water-grid project, focusing on Thailand's northeastern region.

GREENING *ISAAN* AND THE "DESERT BLOOM" SYNDROME

Thailand's current irrigated area is around 5 million ha, i.e., approximately 20% of the total farmland, and its dams can now store 70 billion cubic meters (Bm^3) of water. The northeast part of the country, however, remains the poorest region in the country. It is endowed with relatively poor soils and faces a period of 6 mo with scant rainfall. Although it accounts for 45% of agricultural land, it has received only 18% of irrigation expenditure (9). This is mainly due to the lack of attractive sites for dams and to environmental constraints, which are reflected in an average per hectare cost higher than in other regions (9). Although the percentage of the population living below the poverty line has fallen dramatically since World War II, poverty remains higher in rural areas in general (16%) and in the northeast in particular (26%) (10).

Dry countries, or at least their leaders, have frequently been captivated by the "desert bloom" syndrome and embraced large-scale river engineering (11). In the nineteenth century, success stories here and there (for example, in US, Italy, Spain, India, and Egypt) were widely commented upon across the world, and California became an icon of the "desert bloom" (12). These ideas remained very much alive during the post–World War II period, and Thailand was no exception, nurturing the vision that dry *Isaan* would one day be turned "wet." As an editorial from the *Bangkok Post* (13) put it, "The idea of transforming the Northeast into a 'promised land'... has never faded from the minds of some caring northeastern politicians."

As early as the 1950s, Thailand's development agencies perceived water-resource development to be a key strategy toward stimulating the modernization of *Isaan* (14). Moreover, with the region subject to high population growth and seen by many as vulnerable to communist takeover, both national and multilateral lending agencies provided abundant funds for infrastructural development in general and for irrigation and dams in particular (3).

In 1957, the United Nations commissioned a reconnaissance study by the United States Bureau of Reclamation (USBR). The study found that the only way of ensuring the large quantities of water required for large-scale cultivation of crops would be to tap the flow of the Mekong River (15), a conclusion supported by a later Japanese study team (16). In 1965, a study of the Chi-Mun basin by USBR (17) reiterated that the development of multipurpose water resources was needed for "orderly economic growth" in the area, while another USBR team commenced studies on the design of the Pa Mong Dam, a major dam on the Mekong main stem located close to Vientiane, as the cornerstone of the project to harness the Mekong River.

Although enthusiastic feasibility studies and master plans unfolded, the Pa Mong Dam tumbled into difficulties linked to

its scale and to its massive impact on riverine people—the early Pa Mong proposal considered, for example, the resettlement of 400 000 people (15). It was thus easier for the Thai government to start developing tributaries of the Mekong; large-scale and multipurpose projects remained the primary choice of planners until the late 1970s, when upgrades on irrigation distribution networks and the development of small resources started to feature prominently in the government's priorities (18).

In 1987, Army Commander-in-Chief General Chavalit Yongchaiyudh supported a master plan for the development of the northeast called "Green *Isaan*" (*Isaan Kiew*). The establishment of agro-industry was the focal point of development, and irrigation, required to produce raw materials for the agro-processing industry, would "create wealth and job opportunities in the rural areas" (19). Although Chavalit tried to negotiate a loan with the World Bank (20), the project did not eventually materialize.

In 1989, a new grand vision was elaborated under the banner of the Khong-Chi-Mun (KCM) project. The project largely drew from earlier planning documents and integrated them into one large planning framework. To obviate the lack of storage, the project drew from earlier studies on possible channel storage in the Chi and Mun Rivers, with a cascade of regulated reaches separated by dams (21, 22). The 1992 feasibility study proposed to irrigate an area of 796 800 ha in 15 provinces, and construction was envisioned in three successive stages over a period of 42 y (23).

Unlike the earlier Green *Isaan* project, however, the KCM project was (partly) implemented. Weirs were constructed in the Chi and Mun floodplains, and new pumping stations complemented the already impressive number of stations constructed in earlier years by the Department of Energy Development and Promotion. However, the Rasi Salai and Huana Dams, constructed on the lower Mun River, have both triggered protests from the local population whose livelihoods depended on the floodplains. Also, civil society criticized the projects heavily, pointing to the lack of research, transparency, and participation (24).

In 1997, Prime Minister General Chavalit gave full support to the KCM project as the only way to ensure sufficient water supply to "long-suffering farmers of the northeast" and vowed to fulfill the long-held promise of "turning the northeast green" in front of an assembly of village and district chiefs gathered in a five-star hotel at Khon Kaen (25). With the advent of the financial crisis of 1997, large-scale capital-intensive projects were once again shelved. The KCM remained incomplete, its cascade of weirs along the Chi and Mun lower reaches was challenged on social and environmental grounds, and no additional water was imported from the Mekong River.

THE "WATER GRID" AS THE LATEST MEGAPROJECT

This background helps to understand how and why, in July 2003, during a workshop on "Sustainable Water-Resource Management," it was announced that Thailand's irrigated area would be raised from 5 million to 17 million hectares within 5 y; the expected benefit was to enable farmers to cultivate and have access to water all year-round. The plan included transbasin diversions, diversions from Cambodia and three Lao rivers; a total of 18 diversion alternatives was listed. Overall, it would cost 200 thousand million baht (USD 5 thousand million) to solve the problem of water scarcity in Thailand and help to "turn Thailand into an agricultural powerhouse" (26). Thailand's northeastern region was to be the major beneficiary of the project conceived as part of the plan to "eradicate poverty" in the country, and Deputy Prime Minister Suvit Khunkitti—himself a representative of Khon Kaen province in northeast Thailand—was put in charge of overseeing the initiative. Borrowing from the power-generation sector, the project was dubbed "Water Grid," to describe a set of interconnected reservoirs and basins allowing the movement of water from water-source to water-deficient areas.

The proposal gained momentum with the nomination of Suvit Khunkitti as Minister of Natural Resources and Environment (MNRE). The change removed Minister Praphat Panyachartrak, who had been credited with a genuine intent to upgrade Environmental Impact Assessment (EIA) procedures in order "to catch up with the rapid economic growth" and to promote participation from the public, who, according to him, should "be allowed a much bigger say in state development projects" (27). Although the move had decisive support for the proposal handled by the MNRE, the project remained delayed as a result of a dispute between the MNRE and the Ministry of Agriculture over who should oversee the project, because both ministers reportedly wanted "to supervise the project because it could be promoted in their election campaigns" (28). Indeed, the Royal Irrigation Department was seen floating a parallel 400 thousand million baht proposal (29) that aimed to reach the fatidic 21 million ha of irrigation potential over the next 60 y (yet with a more prudent target for the next 40 y consisting in only half of the MNRE target).

In early 2004, the project came under fire from several quarters, including academics, who doubted its economic profitability (30), environmentalists, who predicted salinity problems or recalled that earlier pilot projects had failed (31, 32, 33), as well as water experts, such as Senator Pramote Maiklad, who opined that the "project is not cost-effective nor feasible in terms of engineering techniques" (34) and thought that its timetable would be unrealistic (35). The feasibility study was nevertheless entrusted to Khon Kaen University's faculty of engineering, which asserted that water would be provided to 10 million hectare of farmland. However, the study also confirmed that there was not enough water domestically and that "water diversion from neighboring countries and international rivers is an essential part of the water-grid project" (28). The study was presented in 2005, and pilot projects worth USD 1 million were expected to be kick-started shortly.

JUSTIFICATIONS AND GOVERNANCE

It is important, first of all, to reflect on the justifications given for such a huge public investment as well as on the governance of the decision-making process. From a governance point of view, the whole process was characterized by secrecy, and often contradictory statements were delivered to the press. Despite the dramatic likely impact on populations, livelihoods, and the environment, in terms of benefits, costs, and externalities, no participatory mechanism was observed. Although there were calls from civil society groups to get more information (as entitled by the 1997 constitution) (36), details of the projects made public were those presented on the DWR website, while the Royal Irrigation Department's (RID) own proposal remained largely removed from the public.

Earlier projects showed that public hearings were often not transparent and were a means to legitimize projects, that public participation had been selective, and EIAs had been shoddily prepared or bypassed completely (36, 37). In the KCM project, for example, dams on the Chi and Mun Rivers were aptly referred to as "rubber-weirs" because EIAs were required for the former but not for the latter. The past stories around the Pak Mun and Rasi Salai Dams echo a traumatic experience of how the assessment of costs and benefits can be distorted (38), and of how attendees to public hearings can be selected (39).

This situation contradicted the statement of former Natural Resources and Environment Minister Praphat that "the public will be allowed a much bigger say in state development projects, which will also face tougher scrutiny from a new agency" (27). The idea put forward by the MNRE, that locally elected subdistrict (*tambon*) administration organizations should approve any project (27), clearly had the potential to jeopardize the water grid and may help to explain the subsequent removal of Minister Praphat.

Several striking features of this multibillion dollar plan denote the willingness to fast-track the project without proper investigation into social, economic, and environmental consequences. Minister Suvit, for example, went ahead with the water-grid project without consulting the National Water Resource Committee, drawing criticism from economists and environmentalists (30), and he said the government would push ahead with the irrigation pipeline despite the early setbacks of such systems exposed by RID's chief (40) and nongovernmental organizations (NGOs) (34). Likewise, Prime Minister Thaksin declared that "whatever the outcome of the pilot projects, the government [would] finish all 13 schemes within five years" (40).

Justifications for developing the water grid in general and irrigation in particular were based on populist arguments that merely emphasized expected benefits and were shrouded in a propoor rhetoric that magnified the assumed power of the state and attendant benefits. The prime minister "vowed to eradicate all water-related problems plaguing the country, which he said were major hurdles in the government's war on poverty" (35). The "war on poverty" was clearly branded as an overriding metajustification that offered a means to silence opposition since, obviously, nobody is against poverty reduction (2).

Focus on benefits rather than on cost/benefit ratios was exemplified by the prime minister, who is reported to have said that "it would not be a problem if the [water grid] project required a lot of money because it would be worthwhile eventually," and by the deputy prime minister in charge of the project, who saw the project as "a worthwhile investment because it will benefit 30 to 40 million people nationwide" (41) and that "every farmer, especially those from the 19 provinces in the Northeast, should have access to water" (40); these statements supported an uncontroversial and desirable future, but with no relation whatsoever to costs or alternative options.

SOCIAL AND ENVIRONMENTAL CONSEQUENCES

A project of the magnitude of the envisaged water grid can only have massive regional impacts: agricultural production does not unfold in a vacuum and has serious economic and environmental implications. This section investigates the main constraints faced by the project.

Where Will the Water Come From?

That *Isaan* does not offer adequate storage sites to store runoff during the wet season has long been recognized. The model used by the "Green *Isaan*" study "clearly demonstrated that the controlling factor in the Chi-Mun basin is the storage of water" (19). With the abandonment of the Pa Mong Dam on the Mekong, from which water was supposed to be abstracted and used in *Isaan* in early projects, planners sought alternative designs to divert water by pumping. The combination of the lack of storage capacity to properly store water during the wet season and the political difficulties associated with abstracting water from the Mekong main stem in the dry season stimulated planners' ingenuity. The water grid borrowed from a study done in 1998 by Sanyu Consultants, which was aptly dubbed the "Laos-Thai Friendship Water Development for Sustainable Agriculture"; this plan envisaged building two dams on the Xe Banghiang River in Laos, close to the confluence with the Mekong, from which 3.3 thousand million cubic meters of water could also be abstracted and siphoned under the Mekong into *Isaan* (42). A similar plan to siphon water off the Nam Ngum Dam in Lao People's Democratic Republic to the Huay Luang stream in *Isaan* has also been considered.

It must be noted that although consultants have emphasized the need for interbasin transfers if the project were to be implemented, this politically thorny aspect of the project was not discussed openly, but rather occulted in the news. Academics involved in the feasibility study at Khon Kaen University also emphasized the need to approach neighboring countries, notably Laos, and/or the Mekong River Commission, in order to secure agreements allowing increased water supply to *Isaan* (30). Uneasiness about the issue grew a few months after the official launching of the water grid, and Thailand tried to redefine the terms of the 1995 agreement, and the director of the Department of Water Resources stated that "it would be a violation of national sovereignty if a nation could not implement development projects or use water from its rivers independently" (43). All these issues surrounding tapping new water resources raise considerable political and economic problems.

Where Will the Labor Come From?

A massive augmentation of irrigated areas would absorb a large amount of labor. The seasonal—and long-term—migration of *Isaan* people to Bangkok or other places seems to suggest that the lack of opportunities have pushed them to look for options elsewhere. At the same time, and probably because of these movements, there are several indications that labor has become short in rural *Isaan*, with observers describing the "exodus of young labor" (44). In eastern provinces, for example, farmers commonly resort to Lao labor for harvesting rice. The quick spread of direct-seeding techniques in lieu of transplanting also indicates labor shortages (45).

One way to assess the residual available workforce is by using data from labor force surveys. A first part of the potentially available workforce lies with employed people who work less than an average of 40 hr wk^{-1}, taken here as the equivalent of full employment. By computing the shortfall of hours worked to the 40 hr standard during the dry season (January–March) for the fraction of the population declared to be available for more work, we can get an upper estimate of the available workforce (46). Nonworking people are the principal potential source of labor, even when computing only those effectively looking for a job. If we use the 2004 Labor Survey to compute the total of working hours potentially available (partially employed or nonemployed and looking for work) and express them as full-time workers (over 3 mo), we obtain an estimate of 17 832 person-labor. With one hectare of rice requiring an average of 30 work days (47), the available workforce could cope with around 50 000 ha, a far cry from the million hectares envisaged.

The possibility of attracting labor back to agriculture is also doubtful, judging from the differential in wage between agricultural and nonagricultural labor and even more from the (higher) differential between wages in *Isaan* and wages in Bangkok, the former being half the latter. In addition, in northeast Thailand, the net profit from paddy cultivation was estimated from –USD 49 to +USD 21 ha^{-1} $crop^{-1}$ for irrigated high yield varieties of rice in the wet and dry seasons, respectively, and at –USD 44 for the traditional wet-season rain-fed local variety rice when family labor is valued at USD 2.5 d^{-1} (48). It is therefore uncertain whether enhanced local

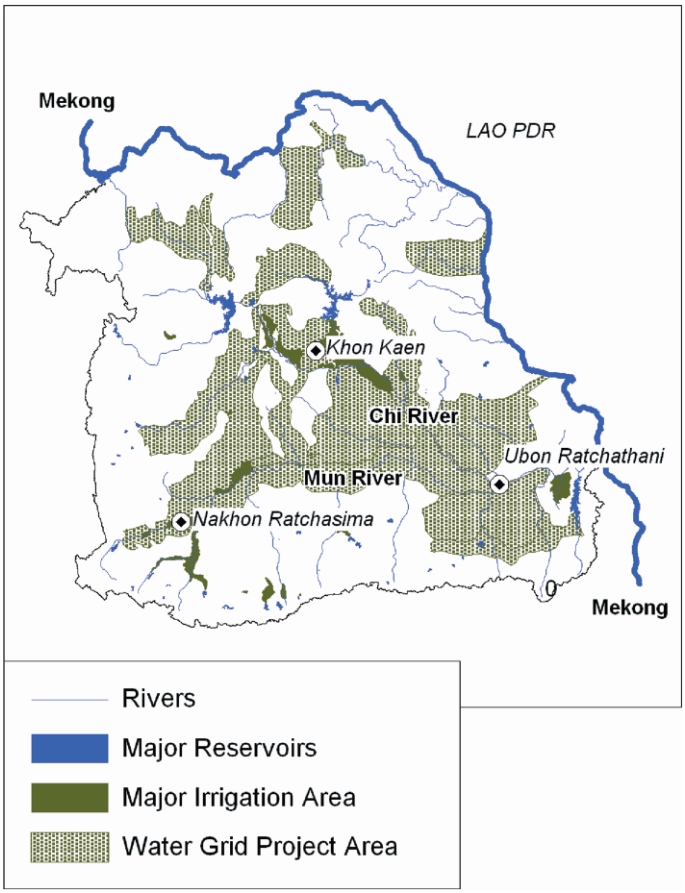

Figure 1. General layout of the Water Grid Project.

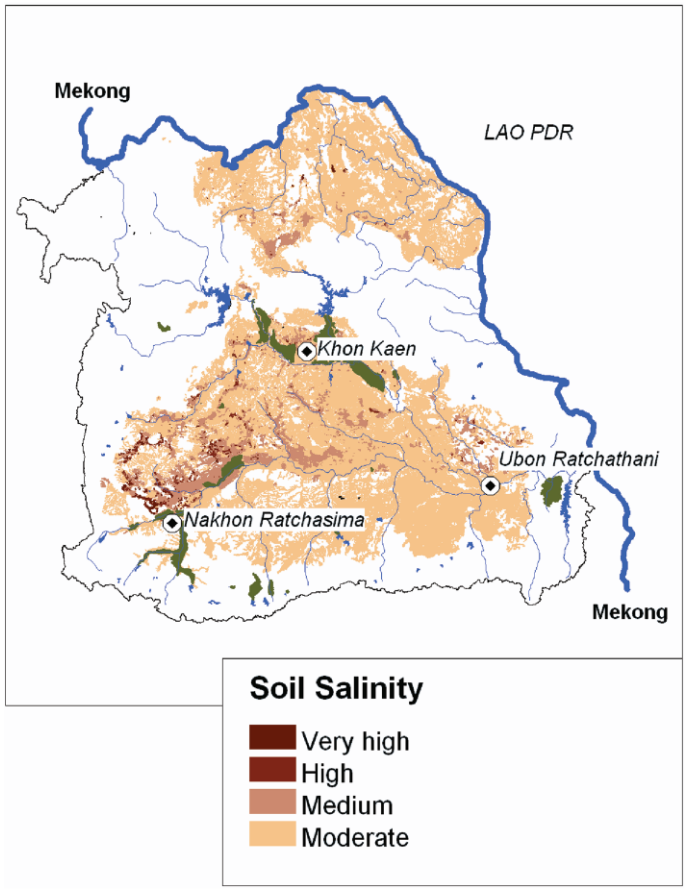

Figure 2. Salt in Northeast Thailand. Very high: salt covers more than 59% of surface; high: salt covers between 10 and 50% of surface; medium: salt covers between 1 and 10% of surface; moderate: salt covers less than 1% of surface.

agricultural opportunities would significantly alter migration patterns.

Another worrying factor is the current demographic evolution in the region, and more generally in Thailand. The demographic transition has been extremely sharp in the country, and annual population growth is now lower than 1%. With many ageing farmers, economic diversification, and migration opportunities, the future of farming in the region is threatened, and patterns of agrarian change will be heavily shaped by tensions on the labor market as time goes by (49). The project thus stands against all current trends of demise of agriculture, not only in Thailand, but also in most of Southeast Asia (50, 51).

Environmental Change

The northeast of Thailand is well known for its soil salinity, which is widely considered to be one of the most critical environmental problems of the region. The salt source for saline water and soil in northeast Thailand is primarily from rock salt of the Mahasarakham Formation and from tectonic stress during the Quaternary, which produced superficial domes with a high salt content (52). Soil salinization is also induced by human activities, namely deforestation, water storage, and groundwater abstraction for salt production (53, 54). With about 2.8 million hectares of land affected in the discharge areas and a corresponding 3.1 million hectares in the recharge area (55), the buildup and spread of salinity in northeast Thailand have resulted in major economic and environmental impacts.

Salinity constraints in *Isaan* were identified early on. The reconnaissance survey on the Chi-Mun basin carried out in 1965 acknowledged that salinity problems would doom the project "to eventual failure without adequate drainage facilities, which in the area may not be financially feasible" (17). The KCM project would prove this prediction true. With the construction of the Rasi Salai Dam and storage of (saline) dry-season flows, salinization was introduced to highland paddy fields, which in turn forced farmers to increasingly give up dry-season cultivation, the very reason why the storage was built in the first place. In addition, water tables raised by the impoundment of water by the weirs have come close to the surface and fueled capillary rises and subsequent salinization of the soil surface.

Because of sustained protest regarding the implemented KCM structures in the lower Chi-Mun basin (56) an "expert committee to analyze environmental impacts" was formed by the Ministry of Science, Technology and Environment. Its report, submitted in 1993, criticized the KCM project and stated that the project design was inappropriate to the geographical landscape of the northeastern region and that the information in the feasibility study was misleading. The committee further warned of increasing salinity problems as a result of the large-scale water-diversion and irrigation plans (54), as did the 1995 Mun Water Resources Development Master Plan Study (57). Figure 1 shows the extension of the planned water-grid areas alongside areas identified as actually or potentially affected by salinization (Fig. 2), and it speaks largely for itself (58).

Other negative impacts that can be expected from massive development of field crop cultivation in the dry season are pollution and health hazards derived from the use of agrochemicals. Similar impacts can be expected on fisheries within the basin as well as in the Mekong River (56).

Agricultural Production and Markets

The last question begged by such a project is: what will be produced and how will it be sold? Although the price of rice at the Thai farm gate is strongly determined by the international market, it is obvious that massive increases in production would only further deplete already declining real prices, undermining the attractiveness of double-cropping to farmers who already allegedly see little virtue in it. Indeed, several reports suggest that dry-season rice cropping has not developed according to expectations and has left many infrastructures idle—the total land under dry-season rice cultivation remains at about 14% of the total irrigated area (56). Adulvudhaya and Tsuchiya (59) recounted that problems always reported by farmers as hindering the adoption of dry-season cropping are lack of capital, shortage of labor, and soil salinity.

Farmers are expected to switch from rice cultivation to other cash crops that consume less water than rice. The question of diversification away from rice cultivation has been emphasized in practically all agricultural policies since World War II in Thailand as well as elsewhere. It has been shown, however, that public policies aimed at fostering diversification have met with little success (60), have been unable to capture the complexity of farmers' decision-making and constraints, and have sometimes induced farmers into debt and bankruptcy (61).

Historically, agricultural diversification in Thailand has been fostered by middlemen in close connection with market demand, leading to both higher diversification in paddy-growing areas and deforestation to accommodate field crops in demand in the market (62). Such market demand is often induced by deficits in the regional or world markets (e.g., kenaf in the 1960s, pulp in the 1980s, rubber at present) and cannot be generated artificially. The contract farming system with agribusiness companies was believed to ensure that farmers can sell their produce at reasonable prices. Although the experience of the Nam Oon project, for example, initially showed that there are niche markets that can bring substantial profit and opportunities to farmers, benefiting 4000 households in 1993 (63), development of cash crops leveled off due to three main factors: limited market opportunities, labor constraints, and unwillingness of farmers to face the health hazards brought about by pesticide use. Additional water-management problems later made the World Bank shift the project into the "unsuccessful project" category (9).

DISCUSSION AND CONCLUSIONS

Much of the water-resource and irrigation development in Asia in the period from 1950 to 1980 has been justified by overriding national policies. Concerns for enhanced national security, maintenance of political stability, alleviation of rural poverty, food security, self-sufficiency, or export-substitution, were pervasive. "Modernization" has also been a compelling and emblematic flagship of policies. Other strategic or geopolitical objectives, such as the struggle against the spread of communism in Asia, have also fueled infrastructure development.

There is now a wide recognition that under present circumstances, massive injection of public investments in irrigation infrastructure is unsound, at least where there are no large contingents of unemployed people (4). The estimations provided by Fan et al. (10) on the benefit/cost ratios of different types of investments in Thailand, for example, suggest that irrigation is likely to be the least attractive infrastructural investment at the moment (64).

The lack of assessment of investment options is apparent even within the rural water sector proper. It is remarkable that no in-depth assessment of all the small- or medium-scale projects, including deep or shallow wells, weirs, pumping stations, farm ponds, and other reservoirs, has been undertaken. It is also common knowledge that a large part of these investments have been wasted by siltation, lack of maintenance, poor location, or realization of lack of interest from farmers, and they are often left idle (18, 65). It is safe to assume that nobody wants to know; this accentuates the perception that all these projects have been largely politically motivated, leading to inefficient use of public resources.

In retrospect, the water grid appears to be the ultimate avatar of a long history of plans to "green the northeast" of Thailand by diverting massive amounts of water into the region. The project objectives were couched in terms of national interest and poverty alleviation and implicitly presented as an overriding priority. This contributed to crowd out any possible discussion on the relevance and cost-effectiveness of the project. As a rule, megaprojects combine human hubris with populism, their benefits are exaggerated by an "optimism bias," and their costs are systemically underestimated; they favor private political and financial gains to the detriment of the public interest; and they overlook social and environmental impacts (5). All these ingredients are constitutive of the water grid.

The targets of the water grid are so ambitious that it strains the imagination to envision anything close to its realization, not to mention its remarkable environmental implications. The project has been shown to be highly inconsistent with four distinct potential constraints: the lack of water that can be mobilized in a cost-effective way, the current limited availability of labor, the pervasive salinity problems, and market constraints to intensification and diversification. Thai politicians tend to stick to the idea that Thais are a nation of rice-growers and that provision of irrigation infrastructure is possibly the best development option for the countryside (66). This view ignores voices that argue for a more vigorous orientation of the economy towards higher-value activities, in line with what is observed, for example, in Malaysia.

It is also apparent that, despite warnings and misgivings from part of the administration or from the civil society, water-development plans seem to be only marginally informed by social or environmental concerns (67). The case study presented in this article shows that the checks and balances potentially provided by the most professional segments of line agencies and by civil society may be insufficient to both derail the project and impose a more open decision-making process. Secrecy was essentially the rule of the water-grid project, and even if the whole project had arguably no chance to be realized, it is likely that some part of it would have gone ahead if the Thaksin administration had not been abruptly terminated in September 2006 (68).

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