

# Strategic Communication for the Groundwater Management: The Case of the “Clean Groundwater for Schools in the Remote Areas” Project in Thailand

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## Abstract

In 2013, the project called “Clean Groundwater for Schools in the Remote Areas”, as initiated by The Department of Groundwater Resources (DGR), was completed. The primary goal of the project was to provide clean groundwater for 2,478 schools throughout the country, especially those in remote drought-prone areas that were classified as “having severe problems of water shortage.” This case reviewed the roles of strategic communication employed by the DGR in carrying out the CGSRA project. The three forms of communication utilized as the organization’s development tool and trust-building mechanism were: risk communication, crisis communication, and participatory communication. The case recounted some technical and socio-cultural hardships that occurred during the process of project implementation. Participation involving multi-stakeholders with differing agendas, perception, and interests could not be gained easily without organizational mandates and commitment through Stratcom.

**Keywords:** *Strategic Communication, Risk Communication, Participatory*

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# การสื่อสารเชิงกลยุทธ์เพื่อการจัดการน้ำบาดาล: กรณีศึกษาโครงการน้ำบาดาลสะอาดเพื่อโรงเรียน ในถิ่นทุรกันดาร

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## บทคัดย่อ

ในปี พ.ศ. 2556 โครงการน้ำบาดาลสะอาดเพื่อโรงเรียนห่างไกลที่ริเริ่มโดยกรมทรัพยากรน้ำบาดาลได้สำเร็จเสร็จสิ้นลงตามแผนช่วยเหลือโรงเรียนในถิ่นทุรกันดารทั่วประเทศ รวมทั้งสิ้น 2,478 โรงเรียน กรณีศึกษานี้ได้นำเสนอบทบาทของการสื่อสารเชิงกลยุทธ์สามรูปแบบในการดำเนินงานดังกล่าวให้แล้วเสร็จได้แก่ การสื่อสารความเสี่ยง การสื่อสารในภาวะวิกฤติและการสื่อสารแบบเน้นการมีส่วนร่วม ใงานวิจัยนี้ได้นำเสนอความยากลำบากทั้งในเชิงเทคนิค และด้านสังคมวัฒนธรรม ในการดำเนินโครงการให้แล้วเสร็จท่ามกลางกลุ่มผู้มีส่วนได้ส่วนเสียหลายกลุ่มที่ต่างก็มีวาระ มีการรับรู้ปัญหาและเป้าประสงค์ที่แตกต่างกัน

**คำสำคัญ:** การสื่อสารเชิงกลยุทธ์ การสื่อสารความเสี่ยง การสื่อสารแบบเน้นการมีส่วนร่วม

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Thailand is an agricultural country producing food for the world. Yet the country faces serious challenges in the water sector. Almost every year, the country has faced natural disasters such as droughts, especially during the summer times, fires, and flooding that have plagued broad regions of the country by undermining agricultural and industrial productivity, especially the social well-being and social fabrics of the communities. Worse, some regions; for instance, the upper Northern part and the North Eastern part of the country, face with the recurring problems of chronic drought, which has led to the shortage of water consumption. Agriculture alone is considered to be the primary user of water, absorbing nearly 5,655 million cubic metres of groundwater, found in 90 percent of every part of the country, per year. During the seasons of drought, it has been estimated that 15 million rais\* of land were used in agriculture and consumed much of the groundwater due to the lack of adequate water supplies of the surface water.

In fact, groundwater is the major source of drinking water of the country, as UNESCO reported in 1998 that nearly half of the world's population use groundwater for drinking and other purposes. In 2011, The Department of Groundwater Resources (DGR) of Thailand, Ministry of Environment, reported that Thailand has 24 times groundwater in quantity higher than surface water. There were up to 27 national water tables around the country; and 6,000 groundwater wells in number operated and run by the private sector. And yet, it was also reported by the DGR in 2011 that 50 percent of the schools countrywide confront every year such problem of water availability, especially the shortage of clean water for drinking for communities and for children in schools.

Foreseeing the adverse impacts on the health of schoolers, the DGR was managed to launch the project called "Clean Groundwater for Schools in the Remote Areas" (CGSRA) in 2009. The regulatory body of personnel in charge had surveyed the number of schools in need of groundwater management throughout the country. It had been reported that Thailand had approximately 32,186 schools countrywide in number; but 2,478 schools in the remote areas were classified under the DGR's priority lists with the label of "severe shortage cases" being applied. Strategic communication had then become the key tools for project implementation and development, and incorporated into the major scheme of the CGSRA project with emphasis on the support of public and community-based participation.

## **The Challenge of the Water Sector: Where Groundwater became the last hope, yet Scarce and Risky Resource**

Supoj Jermwasdiphong, the Director-General of the DGR stated that since 2012, the statistics indicated that there were higher needs in using all types of water in Thailand, including groundwater, with 80 percent of groundwater used in agriculture, 3.9 per cent for consumption, and 4 percent used in the industrial sectors. According to Khun Somrit Chusanathat, Deputy to the Director General stated that Thailand has a tendency to face the critical water shortages for consumption especially in the urban areas or highly populous areas like in the large cities. Back to the year 2001, the statistics of water consumption in the country surveyed was about 55,400 million cubic metres per year, and it has further predicted that the national needs to consume water would soar up to 124,600 million cubic metres per year in 2021 or almost three-fold. It has been predicted that in the year 2021, Thailand would face water crisis with the need of water consumption at about 53,800 million cubic metres water per year.

In 2011, Thailand has faced with the legendary nightmare of flooding, the DGR then attempted to help alleviate the water problems by cleaning up, restoring and revitalizing the quality of groundwater and the water wells throughout the country, especially in the areas where affected by the floods. In 2012 the country has been reported that 650 mega-sized and medium-sized projects of water sources development and 60,000 small-scale projects to reserve and store the water levels up to 70,800 million cubic metres of water in volume were developed in preparation for the future risks of water shortage. The DGR has exerted efforts to educate the public at large about groundwater and the proper groundwater management and maintenance, in cooperation with other regulatory government agencies in charge of Water Sector Management; e.g., The Department of Water Resources, Provincial Water Works Authority, Metropolitan Water Works Authority (Thailand), etc.

Accordingly, Vilawan Thaisongkram, head of the Central Administrative Office, D GR, stated that despite the national policy driven by the Thai Governments in the reformation of water sector institutions, significant changes towards sustainable water supply and use have not been yet satisfactorily achieved. She mentioned that the unsustainable supply and use

of water is a threat to health and also to the country's development and this particularly affects poor population, including schools in the remote areas. The problems of the groundwater were multi-dimensional. She stated that:

The crisis of water problem facing 2,478 schools in the rural areas in general cases were about the shortage and the quality of drinking groundwater. The lack of adequate budget allocated from the government for the installation of standardized drinking groundwater systems in schools is another severe problem. Actually, these schools have very limited resources and budgets to develop their own water management systems. In terms of water availability, the conditions of problems can be worse and even more complicated. In some provinces, some pieces of land are lack of potentialities to develop the groundwater resources since there were no water tables, or natural aquifers in their natural resources. Water availability is a real problem for them. Villagers, including children and kids, normally consume whatever surface water avails, where no wells of groundwater were to be extracted in their communities. Girls and boys go fetch water. The surface water is unclean, and also partly as a result of lack of wastewater management treatment in communities. We have found that in some provinces, groundwater also contains naturally occurring contaminants such as fluoride. In the Northern and North Eastern of the country, for instance, a number of people developed bladder Calculi. This was partly because the water quality has been deteriorated. Moreover, apart from the severe and chronic water scarcity, numerous drinking wells have dried up in many areas and the water tables has dropped in many provinces. Gross extraction of groundwater of the total amount of water pumped from wells; as well as wellhead protection, or protecting the areas surrounding public drinking water supplies, were not supervised closely in practice.

Vilawan then talked about the inception of the DGR's outreach project called "Clean Groundwater for Schools in the Remote Areas" (DGSRA), targeted at 2,478 schools around the country, where the

situations could be of real challenges for DGR. The challenges were multi-faceted in nature; budget constraints, the chronic droughts, plus the complexity of the severity of the situation involving groundwater management situation. Vilawan stated that:

The project "Clean Groundwater for Schools in the Remote Areas" was initiated and launched in 2009 with the ultimate goal aimed at the nation-wide enhancement of the quality of life for poor schoolers, especially the severe cases. The fundamental elements of problems characterizing these severe cases with 2,478 in total number were: 1) these schools possessed no groundwater supply systems of their own, 2) not even capable of accessing to groundwater sources in their communities, and 3) nor had adequate level of drinking water in the everyday life, which all these problems had become the major problem facing our country. Within the year 2012, we aimed that we are going to achieve the whole number of our targeted 2,478 schools in the remote areas. The benefits are not only to get clean groundwater for our kids, but also extended to the preparation and prevention of water crisis of shortage in the face of natural disaster if it ever happens, for example, during the droughts or flooding or plaques. The project was going on well. In 2011, we have accomplished our goals for the total of 396 schools in the far remote areas, in 2010 we achieved 430 schools, and in 2009, 60 schools were the number of the finished cases under the CGSRA project.

According to Thaweesak Petchrak, the Senior Mechanical Chief, Head of the CGSRA project from Nakorn Rajsrima, a province in the North-Eastern region in Thailand, told about The Memorandum of Understanding was signed between DGR and the Ministry of Education in the support of the CGASR project. The specification of the groundwater management construction was developed. The groundwater management system in each site comprise the construction of one Water Tower and one cement building with the groundwater quality improvement system. The reverse osmosis system (RO) of groundwater management, which was one of the advanced technologies in groundwater management, was applied. Technical Problems arose after the CGSRA project had been carried on since 2009. Khun

Taweesak used analogy in his statement by saying that:

We DGR has applied the one-size-fits-all construction specification for the whole country. It means that we use the same construction plan and apply for the whole country, just like the whole nation wears the same size of shirt. We should conduct need analysis of each school, no matter larger or smaller in size, in prior to the design of the construction specification. In some places, there were no groundwater availability at all, which means our investment might not be needed. However, I could say that the CGSRA project was beneficial. I am glad to be part of the teams. Many good lessons could be learnt.

Pinich Chamman, the Senior Technical Head of CGSRA project, Kamphangpetch province, added to the point that:

Some schools don't even need the RO system. In some parts of the country, the characteristic of groundwater was brackish water and could not be possible to improve its quality to attain the drinkability. We should have done the Test on water quality in the first place and bring the results to design the construction. What we had instead was we opened for the bidding for RO system for once, the only once, and selected the most suitable supplier. The installation of the same RO was applied throughout the country, which had had both positive and negative sides to the situation.

Additionally, Vilawan stated that in fact, in carrying out the CGSRA project, DGR needed to involve with multi-stakeholders affecting or being affected by groundwater management. These stakeholders included children in the school and their families, schools, local institutions, families, community residents, temples, and all government municipal bodies, including government and private water sector regulatory bodies. They were all targeted to share a stake in the proper management and care of groundwater resources in their local and national areas. However, the real challenges of the project starts internally, that is, within the organization of DGR itself in carrying out and achieving the missions of the CGSRA project.

## **Risk Mitigation through the Enhancement of the Team Spirit of DGR: the Internal Sphere of Organizational Challenges**

The DGR was established in the year 2005 with the five major structural units of working on groundwater management: the Exploration Unit, the Reservation Unit, The Restoration Unit, The Improvement Unit, and the Control Units. Upon the operation of 12 Headquarters of Department of Groundwater Resources throughout the country, 6 headquarters located mainly in the Northern Part of the country were considered as main centres. In the year 2009, the Thai government announced Bangkok and every province in the Kingdom of Thailand to be designated as national groundwater areas. On January 23<sup>rd</sup>, 2012 the government imposed that the water found in the soil exceeding 15 metres level down under the ground were considered to be groundwater, an important national resource. Once, the ex-Director General of the DGR delivered his wise-stated and memorable speech to the DGR officers emphasizing the key roles of the DGR teams in the exploration, provision, construction, education, and maintenance of the groundwater resources management for the public, especially the poor and their children. The key visions and values of the functions of the DGR had been endorsed and enacted through the statement: *"To give away water is the meritorious service a man could do for serving his national fellows, deserving praise and esteem"*. Such statement has been quoted and re-quoted by DGR higher-ranked officers in inculcating the spirits of DGR to the staff at all levels, especially newcomers. With the slogan of CGSRA project, *"Before the launch of the CGSRA initiative, teachers and students bring water to drink up at schools, after the launch of it, teachers and students brings quality groundwater to drink back at home"*. This statement of CGSRA slogan reflected institutional ethos.

Vilawan stated that in 2012, the DGR has appointed and assigned 80-90 teams of DGR on duty working together for carrying out the CGSRA projects with key responsibilities in groundwater management for the targeted schools for the whole country. According to Khun Vilawan, most of the technical DGR staff were female. In the recognition of the difficulties, hardships, and challenges of the tasks under the CGSRA project, all DGR staff would be socialized into the organizational culture of DGR by being

adhere to the core values of the organization, emphasizing role responsibility with service-mindedness. This was essential in the reinforcement of the organizational values in the prevention of high turnover rate of the DGR employees. Vilawan indicated the right attitude and pride in work was imperative for working with and in the department.

We must first indoctrinate them to feel proud and have pride in their works. The jobs is not easy. We provide motivational and inspirational education and community-based action programs involving individuals, communities, public and private entities, and of course, our own DGR staff in groundwater management, conservation, and protection. To make merit with groundwater concept works out pretty well in the Thai workplace context.

The Director-General Supoj emphasizes that the challenges of the CGSRA project lied in the heart of Staff's learning, schoolers' learning and the community's learning. How to make every citizen in Thailand learn to learn that everyone, including every DGR staff members, can act together to protect groundwater and their groundwater resources since everyone had a stake in maintaining both its quantity and quality is vital. He stated that:

The greatest gift of all to community is health. We have trained our DGR staff to pay serious attention to the public perception of health and risks concerning water consumption, and to learn about it. From our experience, community tends to ignore or even simplify messages on health and risks. Despite the fact that our DGSRA project was beneficial to them, some schools are reluctant to be part of our project. Therefore, our DGR teams must be able to learn and develop more comprehensive groundwater management strategies, monitoring programs within and across targeted communities, and ensure that community residents recognize groundwater's essential role in their own community and develop networks to monitor and improve sustainable groundwater management efficiently. Our DGR teams need to be trained and adequately supervised to ensure that they give relevant and comprehensible information in a respectful and culturally sensitive manners.

Our team should be able to frame their messages regarding the possibility of public health harm. These messages are crafted in the forms of information regarding groundwater management, risk on quality of the water messages, and message regarding self-efficacy of the public.

Moreover, the capability of DGR teams in building and maintaining trust and confidence in the groundwater management project was an essential task due to the fact that individuals and communities may feel more or less threatened by the health issues caused by groundwater quality. A number of people viewed groundwater with contamination as less risky than having no clean water to drink up at all. Trust is then important under circumstance of risks involved where people feel they are inferior to fate or have very little control over their exposure to health risks or potential hazards. It is the sole responsibility of the DGR then to consider how best to develop and maintain confidence in risk management practices underlying the project of CGSRA.

According to Juntarat Pinsamphan, the DGR scientist and a member of Committee for the Quality Control and Testing of the Groundwater Management, all 9 DGR scientists cooperated as a team in doing testing and analysis of groundwater quality in order to make sure that the quality of groundwater were up to the World Health Organization. In 2011, 46,000 samples of groundwater from the whole country were tested and analysed both before and after the RO processing. She stated that:

We have what we call "Observational Wells" or "Wells for Surveillance". We have constantly test the water quality for the CGSRA project in making sure that our quality of groundwater could be up to the world standard. Our water users, the communities, the schools, the factories industry, could all be benefited from our services.

In Thailand, the community trust is contingent upon overall institutional performance and their reactivity to the public concerns. Thus, improved communication to strengthen the community learning was such an important method in which the problem of proper groundwater management must be addressed in a systematic and efficient way. The audience-oriented communication strategies can play a catalytic role in accelerating the rate of groundwater knowledge and simple technology transfer to the schools

and communities through providing relevant information on attitude, knowledge, and skills training. Vilawan stated that aptitude was necessary for a DGR team agent to be smart communicatively. She stated that:

Our DGR agents should be able to learn as he or she acts, reacts, or interacts with environment. They must be able to equip with social ability in working with or coordinate with other agents as a team and with the community. They must also be able to work with communities who may not adore “science” talks. Our goals are in fact about to induce desirable behavioural change among our targeted audience. The functionality and utility of our DGR team lies in what they could serve or do or facilitate such changes for the community. Credibility is very important to the believability and effectiveness of our messages. It takes time to build trust. Our DGR teams prepare to have more information and awareness about adverse events, the benefits of the program, along with the need to sustain the CGSRA project. Moreover, ability to control one’s emotion, and display respect, tactfulness, modesty, politeness, with social perception skills are all important. Their whole *raison-d’etre* is to function as one’s trusted government personnel from DGR.

According to Taweesak, it was very important then for all DGR staff to have “right consciousness towards their own works. He stated that:

We must have the right consciousness in doing our work and in working with our supplier for the quality control of our well construction. . The service-year of one groundwater well should extend to 20 years in use. It belongs to the community and it is useful for community in the long run. In some places, we face the situation where the groundwater well could be used for only one year. This is all about quality, responsibility, dependability and trust issues. We have learnt some lessons. I have tried my very best. So many intervening factors emerged in practice, though.

It is the duty of the DGR to consider how best to develop and maintain confidence in risk management practices underlying the project of CGSRA. In Thailand, the community trust is contingent upon institutional ethos,

institutional performance and their reactivity to the public concerns and the extent to which their institutional workers or actors could involve and engage the multi-stakeholders in the risk management decision-making process. The path to acquire trust from the local community was not a rosy one. So many challenges lying ahead for the DGR teams to learn to conquer.

## **The True Challenges: Where Technical and Cultural Rationalities collided**

Carrying on the project of CGSRA was quite a daunting task in itself. The DGR team had faced with not only technical difficulties, but also in dealing with diversity in the prior belief or pre-existing belief systems of the local people. The main tasks of DGR are then said to be both technical and socio-cultural, as perceived risk relating to groundwater management issues is not only factual, but also social and relational in nature.

To start with the technical hardships. In Thailand, each region had diverse geological conditions with different conditions of groundwater. Whereas some parts of the country had ample level of groundwater table in quantity, others were barely found groundwater underneath, topped up with the problem of quality of the water, which was too salty in its components. The CGSRA project operations dealt with site visit and fieldwork practices, capacity building, awareness raising, and accountability among water users. The project ranged from site survey for groundwater situation covering the aspects of quantity and quality of groundwater in each province, the launch of groundwater development projects for the support of clean water for schools in the remote areas, to the site drilling, and establishing groundwater systems to process the extraction of raw water underground to be improved in its quality of the water until it becomes clean drinkable water that meets the standardization and requirement of the WHO. Director-General Supoj stated that despite the utility of the project yielded to the community, problems oftentimes occurred. In fact, the service year of CGSRA project covered 2-year service for each site management, since its beginning to the end, from groundwater wells construction to the groundwater management system construction, to the community-based education and training. The project problems stemmed from the complexity of the tasks itself. He stated that:

The technical functions of DGR were multi-faceted. There were several steps to be executed for the Groundwater Exploration and Development under the CGSRA project. From preliminary analysis, which means DGR Team needed to analyse the basic information about the targeted community, number of households, geographical conditions, geological map for groundwater resources, to site or Fieldwork Exploration based upon the application of the sciences of hydrogeology and Geophysics, to Site Selection using Resistivity Survey, to Wells Drilling Methods and Technology using Electrical Logger for Soil, Aquifer and Water Table Analysis, to Design for Wells and its construction, to Groundwater Well Development, and then, the following steps were Groundwater Extraction Test, Quality of Groundwater Test, Improvement of Groundwater Quality, and lastly, came to the Utility and Usage for groundwater for consumption. It is easy to see how technical the project could be.

Director-General Supoj stated furthered that despite the difficulties facing, the CGSRA project is indeed beneficial in several aspects, physically, psychologically, mentally, and emotionally. He stated that:

Not only we aim to increase the quality of life enhancement, and health promotion of people in the communities, but also we have tried to improve the psychological aspects of quality of life for the local people; especially for the poor children throughout the country. People could feel mentally secured in knowing that their drinking water is drinkable. Kids in schools are happy we were there for them. Girls no more need to go and fetch water from the ponds. We DGR are happy for seeing the children and families happy too.

Problems, nevertheless, emerged when some groups of the local stakeholders were unwilling to collaborate in the CGSRA project, while others requested something in exchange for extra favour they could have in return from the DGR. Director-General Supoj stated that:

Problem arise politically. We try to transfer both our knowledge on groundwater management and responsibilities to the local municipalities, they somewhat reject. Their reason was that

the process is too technical and too difficult for them to provide after-installation maintenance of the whole groundwater system. Moreover, they claimed that the schools were not under their direct responsibilities and authority since schools are reported to the central government, not to the local municipalities. The attitude of the local government, and of course, the local people is important for us to learn. That is the way they could react at first. Our teams then need to know how to disarm them with perseverance and hard work. Some local politicians, in need of public popularity vote for them in their upcoming election, asked for privileges by proposing DGR their own "lists of schools" to undergo the groundwater management project regardless of its necessity. These are the cases where the politicians made promise and commitment with the communities that if they going to case votes for them, they have all power to exercise and authorization to get the installation of groundwater management project in place.

Apart from the technical and attitudinal aspects, then, came the hidden cultural dimensions affecting the operation of the project. When it came to the steps of promoting the awareness raising campaign of the CGSRA, the DGR teams needed to bring into consideration the importance of existing cultural beliefs and practices prevailed among local communities. The community's disbeliefs or disagreements about risk perception posed on issues regarding the acceptability of modern groundwater management and the quality of water could be varied. Suthapa Phokaow, the Public Relations Officer of the DGR stated that due to the very fact that political, cultural, or religious leaders were oftentimes perceived to be influential opinion-makers, their messages could strongly affect community participation levels and behaviours. Some of these influential people were superstitious, which their beliefs systems could be the major hindrance to the CGSRA operational process. The interpersonal skills were then important for the DGR teams. She stated that:

Whereas our DGR teams use Resistivity Survey to locate the aquifer underground, some communities claimed that their shamans were naturally gifted and equipped with special supernatural talents in being able to psychically locate the source of groundwater using only the power of mind and a

wand. The villagers believed that their ways of knowing were more effective and cheaper. In some areas, we found out that the local people believe in some respected folkways of tracing and tracking groundwater, e.g., using the power of psychic meditation, using coconut shells to predict the location of water table, or by doing some superstitious ceremonies performed by the village shamans themselves. These methods are still popular and practiced in some remote areas in Thailand. These sets of local beliefs could not be proven scientifically, thought.

Moreover, Thai culture is hierarchical in nature; therefore, people were culture-governed and they were not trained to “question authority”, especially those people in and with the power in communities. To note, if distrusted sources provide information that appears to be contradictory to the prevailing beliefs systems, the information could influence people’s attitude in the opposite direction to that being promoted in the first place. Some villagers could become more cynical regarding the credibility and the communication competence of DGR as the source regarding their intention, their ability to work and to communicate about risk issue in question pertaining groundwater management. In fact, Noppavit Chaimala, Senior General Manager to the Office of Public Participation Support, a unit under DGR, shared with story of extreme case where some pre-existing sets of local beliefs could override the logics and reasoning driven by the DGR teams by telling that:

We give them the groundwater system but the villagers in Rayong province improperly managed to use and exploit our given groundwater system to produce the fish sauce. They believe that fish sauce production, a familiar application of local wisdom and folk wisdom is easier for the management and more advantageous for them than. This was unacceptable practice by which we need to use the power of narratives to tell and sell our students and targeted community members about this past mistakes and let them learn from the past in the form of pre-warning messages.

Accordingly, Suthapa further posited that community leaders could become valuable and strategic partners in the promotion of the project. They could also become key informants to converse with because these local

leaders, whether religious and political, could positively affect community's trust in and willingness to join the groundwater management programs. The DGR team hence needed to show respect towards different sets of beliefs and communicate in “a politically corrected” manner. Hence, understanding that perceived risks could be a composite of beliefs, values, and specific context, DGR teams then needed to show respects towards such folk beliefs before moving to adapt their messages to the beliefs of the listeners and to gradually educate the villagers and communities using simplistic scientific explanation. The younger generations, namely, the children in the schools then could be useful as the “middleman” between the DGR and their communities. They could bridge the perception gaps between their communities with the technician teams from DGR.

Importantly, under the CGSRA project, the “Children Learning Centre” was then set up in schools in the remote areas for providing the Child-Education Programs for the Water Management and the knowledge on Reduction of health Risk concerning water and groundwater consumption. The activities under the campaign entitled “Youth Love Groundwater” has been carried out throughout the country. Khun Suthapa stated that the Children Learning Centre was beneficial in promoting the partnership and alliance among children, their schools, their families, and their communities. Several things to be learnt in preparing these children to become the “liaison” of DGR and the future groundwater resourceful persons. She stated that:

Students are found to be eager and open up to learn about groundwater and the chemistry of the groundwater. Basically, they will learn about where their drinking water comes from, why it is vulnerable to risks of contamination, and find out about source water assessment and protection. Our DGR team would use simplified language to demonstrate groundwater concepts; for instance, the water cycle, groundwater basics, local and national groundwater. If the natural quality of groundwater to be used for human consumption presents a health risk, water treatment will be of necessity. In fact, students scientifically learnt that the health risks can be caused by naturally occurring substances include: microorganisms, i.e., bacteria, viruses, and parasites, radionuclides, or heavy metals, i.e., arsenic, cadmium, lead, or chromium. We have

taught them to learn about groundwater stewardship and to become a good community steward of groundwater based upon the belief that protecting groundwater help reduce risks to one's community water supply since everyone can pollute groundwater, i.e., poorly sited or constructed water wells, or improperly built or chemicals or fertilizer spills. Students then need to learn to acknowledge the causes of preventable groundwater contamination. We want them to be aware of groundwater protection involving two basic categories: keeping their groundwater resources safe from contamination, along with using it wisely by not wasting it. Students are encouraged to investigate history of their community's stories about groundwater and groundwater management, successes and failures. Importantly, students must get involved in groundwater educational activities supported by DGR; e.g., holding a mini-groundwater edutainment weeks for schoolers and local communities. Children could also be the DGR's important strategic partners.

DGR also facilitated in the educational process of the whole community residents about the importance of groundwater and hazards of groundwater mismanagement, with the help from the schoolers. DGR then developed a set of guidelines for the community and their constituents in the communities and provided guidance and support to integrate accountability mechanisms into their processes and procedures. Students could monitor the Groundwater system in their schools. They are trained to take care of the groundwater management system in their communities. This was the way children were enculturated and socialized into the culture of "Youth Loving Groundwater". DGR made sure that the children in the schools could perform their tasks well as the project liaisons and to make sure that students come to learn that the extraction of the groundwater from the pulls must be executed on the basis of equity and fairness in their communities.

Technically, students were trained to be able to 1) test the quality of groundwater by observing the colour and taste, providing the regular maintenance for the whole system according to the assigned date, 2) inform the person-in-charge as soon as possible whenever finding some problems of groundwater systems, e.g., leaking pipe, leaking electricity wire, leaking water tap; 3) perform their roles of surveillance on the whole system of

groundwater management with full responsibility; 4) patrol or provide surveillance on the groundwater system in school in the protection of the system and in the prevention of improper drillings for groundwater usage; 5) reduce the use of chemicals and the chemical dumping on the ground, including helping to bury the waste on the ground and under the ground for the prevention of groundwater contamination; 6) bury the no longer in-use or out-of-order groundwater wells which may find leaking groundwater led to its contamination, and 7) use or consume the groundwater with right consciousness for its sustainability and with well balance by not extracting too much groundwater from underneath. Socio-culturally, students could learn to help DGR publicize the proper use and maintenance for groundwater systems in the schools, and within and across communities.

It was evident that successful project went far beyond risk reduction and its technical rationalities, success was based upon substantively incorporating the local community's beliefs and values into the project and implementing process of the CGSRA project. Children helped in the promulgation of new sets of beliefs among local communities involving the issue of groundwater management.

## **Community-based Participatory Communication through Participatory Educational Programs for Community Training and the Establishment of School Networks for Groundwater Management**

Based on the Director-General Supoj, the National Water Law recognized the needs for increased coordination across government agencies as well as the participation of other relevant stakeholders to achieve the goal of sustainable groundwater use. It calls for the development of integrated water resources management plans at both national, regional, and local level. To make these plans effective vehicles for planning and budgeting in the water sector, the law mandates further the decentralization of groundwater resource management. A necessary complement to the appropriate institutional arrangements is the appropriate engagement of water users in decision-making. This meant the needs and interests of all parties of water users and other interested parties need to be taken into serious consideration.

In details, the objectives of the CGSRA were two-faceted: 1) to provide targeted community the access to the proper groundwater system, and 2) to provide academic knowledge on groundwater and the proper groundwater management and maintenance through participatory educational programs for community training. DGR then needed to carefully plan, execute the plans to describe, explain, and identify hazard areas using referential information intended 1) to present the knowledge in the forms of pertinent facts to the community; 2) to depict risks involving groundwater consumption for targeted or potentially affected communities; 3) to facilitate communication of risks regarding groundwater consumption management before, during, and after discussion with stakeholders; 4) to allow tracking of expected and actual performance on groundwater management; and 5) to serve as a communication tool for community meeting related to current missions and requirements. According to him, he stated that:

We have an institutional mandate to preserve and rationalize groundwater resources throughout the country. The small media were mainly used, e.g. illustrated pamphlets and video, with content tailored to a given school and community in groundwater management. Scaling up of networking of trained groundwater users in all targeted communities was one among our top priorities. The CGSRA project aimed at groundwater management goals could not be effective at all without the cooperation of the local water users and all related stakeholders. In fact, the future groundwater usage and management decisions that are made unilaterally by government agencies without inputs from community members run the risks of being fundamentally inconsistent with the local needs, as well as the core values held by local governments and others in targeted communities. We need to simply listen and reflect before experiencing the meaning of public participation.

According to Sophit Chanpinitrattana, Director to the Office for the Support of Public Participation (OSPP), a function unit under the DGR and a partnering team to the CGSRA project, it has become mandatory that every government entity needed to enforce, enhance, and encourage the strong sense of public participation, as imposed in 2011 by the Office of

the Prime Minister, and to abide by the 11<sup>th</sup> National Development Plan for Economic and social Development of the country. The process of engaging in the true sense of public participation involves public inputs. Sophit stated that some challenges facing the DGR in the acquisition of true participation were due to the two major reasons, that is, 1) the local people might have no prior knowledge on and about groundwater and they might not want to cooperate, and 2) the general people were not aware of the value of the groundwater to the community. Consequently, it was not easy to make them become open up and fully participate in and with the project right from the start. To promote the engagement of the stakeholders in the water management institutions, their roles requires further strengthening through the establishment of Community Networking for Groundwater Management. Sophit stated that:

We first go into the field to assess the public perception of the function of our Department. Are they aware of the project? How do they use water in their daily life? We would then manage to provide guidance and consultation of the establishment of Community Networking for Groundwater Access and Management. WE, OSPP, explain to them the benefits of the formation of networking and building alliances in communities. So far, we have had supportive voices from heads of the villages, heads of the provinces, Directors of the Schools, School Principals, families, children in the communities to join us collectively. Community villagers, and the laypersons of Buddhist Temples, and the local government officials, specifically from the Ministry of Public Health, would be invited to join our networking of monitoring the groundwater system with the registered schools under our project. In my opinion, participatory institution like us could have an important and positive impact on both social and environmental aspects of groundwater management. We, the Department of Groundwater Resources, have persistently and gradually enabled community, using the local approaches, to effectively address social conflicts related to water management issues especially during droughts. Everyone could benefit from the inputs the community and all stake-holders generated together. I could say our project goes on well, yet not that smooth. The

overall programming remains uncoordinated in some provinces. Communication management becomes challenges. Some staff of ours from time to time, expressed boredom, discouragement, anxiety, and even frustration that they lack the authority to impose sanctions on the local municipalities. Also, the lacking of local knowledge to effectively engage with them, the water users, is also evident in several places...

More to the point, Noppavit , OSPP fully recognized the groundwater's important role in the maintenance of hydrologic cycle of the Mother Nature, and then attempts to establish the long-termed ongoing coordinated project-based tasks in the protection of both surface water and groundwater of the country. To note, the major tasks of the OSPP office in working closely with DGR teams, dealt with the establishments and the continuing advocacy and promotion of public participation through the two genres of networks: 1) The Enhancement for School Networks for Groundwater Management and 2) The Enhancement for Water Networks for Agriculture. For the latter, DGR held a firm believe that without sufficient water and efficient water management, agriculture of the country would be in bad shape; by which in fact, the agriculture production remains as the main source of income for a large number of poor Thai farmers and rural labourers. Therefore, the Enhancement for Groundwater Networks for Agriculture could make a vital move in public mobilization towards proper groundwater management for agriculture for the agriculture-intensive country like Thailand. For the execution and support of the former, the School Networks for Groundwater Management, OSPP had categorized the targeted schools into the two main groups based on their sizes. As a matter of fact, in the establishment of the two kinds of Networks, he stated that:

We designated that the schools with large size, with 5000 students in number, be it the provincial or county level, will be grouped under the major leagues of our School Networks. In working with the major leagues, we OSPP must make sure that these schools strictly comply with our rules and regulations set forth, for instances, the construction of the groundwater wells must be located of about 30-metres in distance from the sanitary places. For the structure of the group, we provide both consultation modules and training sessions for making sure that they would self-educate about proper groundwater management

and maintenance. I could say OSPP have been so far satisfied with the performances of the major leagues. Meanwhile, we also have clustered the small-sized groups of schools under the minor league, which so far had demanded much more attention from us since they are rather lack of necessary resources needed. Nevertheless, no matter which leagues we are working with, DGR always affirms that two-way communication engaging the community through consultation, coordination and ongoing dialogues is truly essential and put into place for achieving our ultimate goals. I could even say that the politics of the projects also calls for all parties, including School Network members, communities, and government agencies to collaborate in the development and implementation of the project goals and future use visions for the sites, and site management for groundwater resources. Such collaborative dialogues presents the great opportunities for each party to reconcile differing perspectives about the situation, its assessments, and about all risks involving networking operation. The successful cooperation led to the essence of public participation then requires each party to understand the local values and to work together toward incorporating these values into the planning and implementing procedures and processes.

Community-based participatory communication was then put into practice on the basis of such two-way communication, meaning that all parties within the School Networks must be willing to listen, learn, and educate one another on technical, cultural, and policy issues underlying the groundwater management decisions, committing staff and other resources toward mutual engagement. This meant that all the remediation efforts are more than technical activities; they are also political and local parties play a significant roles in the ultimate success of groundwater management projects. Dialogues and discussion needed to take place throughout the process and must include issues related to local perceptions of risks, situation relating to groundwater, and to technical aspects of risks. OSPP then must enter into dialogues with other local governments and community members to better understand how they perceive as the values of having School Networks of Groundwater Management in their areas. The committee of each School Networks must work effectively with us, DGR as the state regulator to meet

the goal of the groundwater management sites in a way and to a degree that allows the sites to remain or become the valuable assets of the local communities. In the meantime, OSPP must be able engage all local stakeholders in determining how the site operation of groundwater system management and the future use goals advance local needs.

Sophit had ended her interviews with the emphasis put upon the prominent roles OSPP played as the state regulator who facilitated learning abilities among all multi-stakeholders involving the School Networks operation. She emphasized that quality of information exchange was emphasized. She stated that:

The significance of participatory communication and network structures is upon the learning at the individual and group levels. Building up positive and constructive climate where social equity through constructive abrasion, if any, among parties, regardless of age and status differences, is emphasized. Normally, in Thailand, silence could be the norms of communication practiced in groups where social status of members are different. Younger students or people with lower status might decide to silence their own voices, which could be considered as important factors that could lead to failure in coordination and communication. Learning to communicate in the climate of dependability and trust is then enhanced. It should be embedded in the everyday practice of living and working in the same community. The creation of “generative learning” type of networks where people in the networks could think, decide to ethically communicate, understand, and even argue constructively. Here learning is regarded as a continuous process which becomes important particularly which such work relies on interpersonal and intergroup communication within and between members and network groups. Collaborative decision making is strongly encouraged because it is as essential elements of networks. We must try harder since in several places, the local people are still passive recipients of the project, as a matter of fact.

The role of School Networks was then vital in providing social support and promoting better response among members of the School

Networks for Groundwater Management, and also for the communities as a whole. Several departmental functions and particular services of DGR were established and delivered to the School Networks for Groundwater Management. These included the provision of technical information on groundwater management, provision of incentives for groundwater management and proper groundwater extraction, provision for groundwater management infrastructure, support the community with regularization of the groundwater wells in different aquifer areas, support the organization of local network groups of groundwater users,

### **“The Culture of Bottled Drinking Water”: An Extension of Benefits where School Networking Leaps towards Community Enterprise**

From the establishment of School Networks for Groundwater Management in every part of the country, DGR and OSP managed to extend the operational scope of the community-based groundwater management to launch “non-profit; but yet economically viable” ways of doing sustainable community’s business on producing the locally-produced bottled drinking water. The overall level of Local business organization among groundwater networks groups was higher in the region where headquarter of groundwater resources located. The focus was on having and encouraging community villagers become active and proactive partners and key actors in their own communities and in running their own community-owned business led by the Schools and its Principals. The process stimulated the villagers to be capable of communicating their perspectives, and a shift to villager-led identification of learning needs through participatory reflection based on practical experience. The Director-General Supoj stated that:

We are quite assured of our groundwater systems for improving the quality of the water with its capacity to produce the volume of water up to 500 litre per hour in most of our targeted communities. Quality of the water is a must. We have helped each community to learn to run their own business of the bottled drinking water. The installation of modern groundwater management infrastructure and new equipment were a good start for them; including provision of resources to support commercialization and technical Capacity and access to market opportunities for bottled drinking water and

to justify investments in new technology. Together with, the provision of complementary technical assistance and support for commercialization of bottled drinking water with a focus on local networks comprising schools, local leaders, families, and poor villagers. We want every party to learn to appreciate the value of groundwater as their precious natural resources they have and to take care of the system of groundwater we set up for them. To make the whole system sustainable is our long-termed goals. We help them as well in the application for the certification from the National Association of Food and Drugs, Ministry of Public Health, for the quality of our bottled drinking water. We have helped them to run the business in the form of local business organization (LBO) in the form of Thai's Juristic Person system. We want them to learn to manage the community small business among themselves for the flow of capital among villagers. We must have trust in them and must be at-all-time ready to listen to them. Parts of the revenues generated from the community business was spent on building the playground for children in the community. This could happen because they learn to participate together collectively. For the minor league, we encourage the local community to help working hand in hand with the small-sized schools.

However, some problems in practice did exist. Noppavit stated that when it comes to the issue of community business management, participation was still mandatory and crucial, but also implied practical challenges:

It happened that for sometimes, calling for community participation was so challenging since the pages in the history of the interrelationships between communities and schools were problematic and full of grudges over identity, leadership, and especially the distribution of the profits from bottled drinking water. Fact is we have to let these multi-stakeholders to work together. We coach them by seeing how articulate they could frame, strategize, and plan for their network well-beings. When we DGR thought that it was the right time for them to go for business, we let them design and decide how to distribute profits from potential revenues from selling the bottled drinking water. That is, whenever some groups of School Networks for

Groundwater Management signalled their readiness to go into business, we would facilitate the process. We would then invite the expert from Government bodies to provide public training on the related topics of "Community Enterprise". We must also negotiate with them from the start that the real goal of the project was to provide the clean Groundwater for the School Children. And most importantly community enterprise is for community sustainability.

According to Vinai Samart, Director to the Planning Division, DGR, he talked about the popularity of the culture of bottled drinking culture among the Thais, especially people living in mega cities; like Bangkok, the capital of Thailand, while in the rural areas people still drink water from the natural resources available in their communities. He stated that:

Thai people in general normally don't drink tap water, like we have seen happened in other countries, like in France or Germany. I am quite ascertained that the community's business on bottled drinking water could work out well in the long run even in the upcountry due to the quality of our bottled drinking water. The rural people may reduce the risks in drinking contaminated water from the available resources.

In terms of business opportunities for the business of bottled drinking water, according to Noppavit, there was great chance available for the Community Enterprise when local competitors transformed into business alliances. He stated that:

Actually, there are other existing local competitors who used to produce the bottled drinking water locally and distributed within the province or the region. First, they were hostile in the community's moves. They need no competitor in bottled drinking water business. When they had come to know that the School Networks of Groundwater management could produce the bottled drinking water with lower cost and higher standard of quality, they shifted their initial positions and decided to contact us and hire us to produce the bottled drinking water for them. Every party now could leap together. Schools get money and return back to the Groundwater management system. Kids have water to sell to their friends in schools. Local

Business owners are happy to this innovative way of doing business with the community.

Phinit even pointed out in fact and in practice, there were “some other political wars” going on along the process of becoming the Community Enterprise facing the School Networks. These wars were “Wars of Identity” where the angst came from some local Mineral Water-bottled Producer or Manufacturers. Their arguments were about the quality of Bottled-groundwater which was incomparable to the quality of mineral water. Phinit stated that:

Our Bottled groundwater passed the RO which contains no mineral. It is very pure. But we have been against from the Camp of Bottled Mineral Water who said that the mineral were superior in quality. Their claim is that drinking mineral water is good for the body, drinking our water makes one’s health weakened.

Upon this matter, Saowanee Nookwao, the DGR Scientist, she clarified that mineral water was a form of groundwater. If the quantity of minerals found in the water was not exceed the set criteria, it could be drinkable.

Despite the fact that going to business for the School Networks faced with some difficulties and hardships, Sophit shared some stories of the success cases. She stated that:

From my experience, the volunteer groups at the Bua Kang Village, in the province of Chiang Mai, are very active and proactive in supporting our program and in building the community networks. At first, we don’t have any budget for paying for their daily wages. People voluntarily come and help filling the water into the bottles. From 500 cubic per day in production capacity increased to 2,000 cubic litres per day. That is quite impressive. When the events of controversies arise, communication strategies should be ready to put into action. In any situations where the feasibility and quality of bottled drinking water production project is questioned, it is critical for the whole School Networks and their community teams to seek to understand the nature and scope of the concerns and all constraints facing them. Schools and communities then have continuously learned to help each other to become successful

models of running the community enterprise.

Suthapa stated in the early period of 2013, DGR has decided to adjust their plans in working more effectively with more appropriate means in working with the minor school networks. The action plans were more realistic in its design for coping with the major and minor leagues of school networks. The idea of DGR redesigning its action plans and helping the School Networks for Groundwater Management and run their own local business organizations has attracted the media attention and other business enterprises. The media has publicized the projects to the public at large to promote such initiatives led by DGR in transforming villagers as passive recipients to active actors in taking care of their community-based groundwater management and the community-based business on bottled drinking water. The Japanese-owned car manufacturer Izusu, Thailand, the authorized dealer based in Thailand, has granted financial sponsorship to the support the School Networks of Groundwater Management project as part of its organizational Corporate Social Responsibility programs with their logos posted on the Water Tower.

From Suthapa's perspectives, the CGSRA project initiatives turned out to be fruitful for the community as a whole. Not only the local communities throughout the country could benefit from the groundwater management programs that could mitigate health risks in their lives, but also they could learn to make use of the groundwater management systems and turn into community revenues where everyone under the School Networks for Groundwater Management could participatively take pride in. Such concertive efforts are more than just activities; they were the representation of how the local parties collectively mobilized and played significant roles in the ultimate success of groundwater management projects. Eventually, the "Youth Network" for Groundwater Management was flourished in Thailand.

Nevertheless, there were some cautionary remarks made by Noppavit. In making such, he cited the present King of Thailand's Philosophy of Sufficiency Economy, emphasizing the values of reasonableness, moderation, immunity, based on the conditioned state of having knowledge and morality, as the true model for community development in Thailand. He emphasized that the community enterprise under the School Networks for Groundwater Management should be developed properly based upon such Philosophy and not to become too commercialized and too business-oriented in its operation in the not too distant future. He stated that:

With due respect, we OSPP don't want the people to become the victims of their own successes. We don't want to see things go out of control when business becomes too much business-oriented. In fact, we do concern that if some networks are too commercialized in perspective, several things are going to be affected, for example, line of production, cost of units, Return of Investment, for the time being, the cost of a 500 cc bottle of drinking water, the electricity, the cost of a bottle, all must be taken into calculation. If the business has become too business-oriented, the total aggregate of production cost of bottled drinking water would be of something different from now, some way out of hand. No more, it would be said that it is for the Public Goods guiding by the philosophy of "Non-Profit" approach to community business. No more we could keep things under control with consciousness. The true sense of public participate under equal conditions would be put in questions and under great skepticism. Now, we are still happy. People are happy. We have run the campaign by associating with the religious belief tied-in with the donation concept. If anyone happens to buy our bottled drinking water for the whole carton, and return it with full packs of blank bottles filled in the carton, we said what they gonna get in return is about the merit-making. People are willing to cooperate. We don't want the local community to be too commercialized at the expense of their own local charms.

## **The Holistic Development for Groundwater Management and Civil Communication: The Fraternal Twins**

It has been almost five years since its inception of CGSRA project being enacted by DGR. The CGSRA project served as a key building block for groundwater management in Thailand. In essence, DGR attempted to push the CGSRA project and accelerate its service coverage to the whole country. Yet coverage had stagnated from times to times due to budget constraints and some process and procedural obstacles involving working with multi-stakeholders. The CGSRA project is also affected by the interplay of local and national politics. However, despite all hardships, in the middle of the year 2013, DGR has achieved its visions, missions, and goals in the provision

of groundwater management system to the targeted 2,478 schools in the remote areas. This means that the whole 2,478 cases of groundwater crisis were all achieved; with the facts bearing that the levels of success for each site management could be difficult to identify quantitatively and qualitatively. The CGSRA program were not achieved its project goals set, but the program has extended itself to offer new ways of community coming together in the forms of School Networks and Community-based Community Enterprise.

Without well-planned, strategic communication, the DGSRA project could fall short of meeting and sustaining its coverage goal. The extension communication and learning and training approach had been provided by building on technical know-how and consulting DGR expert teams on technical problems for which, in some cases, there were no effective and efficient local solutions available on the proper and suitable groundwater management from the first place. Encouragement for community participation by groundwater users and all stakeholders were then vital for reconciling the positions of diverse stakeholders and legitimizing decisions. Overtime, participatory methods were much refined to bring in the views of the intended stakeholders and beneficiaries from the start selecting modes of appropriate communication and consensus-based development initiatives to support the project implementation. The showing of respect towards indigenous ways of knowing and believing was essential. Building trust and expressing trust in children and their dependability as change agents was also important.

Communication was then the key mechanism and tool in bridging diverse groups of people, linking them for mutual understanding, and in establishing a mechanism to guarantee social equality among stakeholders living the society of Hierarchy. In particular, there has been a cultural shift away from top-down communication practices to more consultative and inclusive decision-making processes. The practice of strategic communication was re-orientating towards a citizen or people focus. For DGR, it was no longer assumed that the public will passively or ignorantly react to risk information without active involvement in the risk management process, despite the fact that in some cases, local people were passive recipients of such development. The CGSRA project could be illustrative that the parallel investment in human capital, along with the investment in groundwater management system, was significant for the project success. Provision of examples and lessons learnt

from both success and failure cases were made for the future development of the project involving the groundwater management throughout Thailand

## References

- Covello, V.T. (1992). Risk communication: An emerging area of health communication research. In S. A. Deetz (Ed.), *Communication Yearbook 15*, pp. 359-373. Newbury Park, CA: Sage.
- Dransch, D., Rotzoll, H., & Poser, K. (2010). *The contribution of maps to the challenges of risk communication to the public*. International Journal of Digital Earth, pp. 105-
- Fearn-Banks, K. (2002). *Crisis communication, 2<sup>nd</sup> ed.* Mahwah, NT: Lawrence Erlbaum Associates, Inc.
- Frewer, L. (2004). The public and effective risk communication, *Toxicology Letters*, 149, pp. 391-397.
- Hartman, J., & Lenk, M.M. (2001). Strategic communication capital as an intangible asset, *International Journal of Media Management*, 2(3), pp. 147-153.
- Lundgren, R. E. (1994). *Risk communication: A handbook for communicating environmental safety and health risks*. Columbus, OH: Battelle Press.
- Moss, D., & Warnabe, G. (1998). Communication strategy? Strategy communication? Integrating different perspectives, *Journal of Marketing Communication*, 4, pp. 131-140.
- National Research Council (1989). *Improving risk communication*. Washington, DC: National Academy Press.
- Palenchar, M.J., & Heath, R.L. (2002). Another part of the risk communication model: Analysis of communication processes and message content, *Journal of Public Relations Research*, 14(2), pp. 127-158.
- Plough, A. & Krinsky, S. (1987). The emergence of risk communication studies: social and political context, *Science, Technology, & Human Values*, 12(3), pp. 4-10.
- Raupp, J., & Hoffmann, O. (2012). Understanding strategy in communication management, *Journal of Communication Management*, 16 (2), pp. 146-161.
- Renn, O. (2006). Risk communication – Consumers between information and irritation, *Journal of Risk Research*, 9 (8), pp. 833-849.
- Reynolds, B. & Seeger, M. (2005). Crisis and emergency risk communication as an integrative model, *Journal of Health Communication*, 10, pp. 43-55.

- Ropeik, D. & Gray, G. (2002). *Risk: A practical guide for deciding what's really safe and what's really dangerous in the world around you*. Boston, MA: Houghton-Mifflin.
- Sandman, P. (2003). "Fear is spreading faster than SARS" – And So it should. Retrieved June 15, 2012 from <http://www.psandman.com/col/SARS-1.htm>
- Slovic, P. (1992). Perception of risk: Reflection on the psychometric paradigm. In S. Krimsky & D. Golding (Ed.), *Social Theory of Risk*, pp. 117-152. Westport, CT: Praeger.
- Steyn, B. (2003). From strategy to corporate communication strategy: A conceptualization, *Journal of Communication Management*, 8(2), pp.168-183.
- Wickham, P. (2007). Framing strategic communication for the growth-orientation organization, *Business Strategy Series*, 8(1), pp. 64-71.
- Witt, K. (2000). Generating effective risk messages: How scary should your risk communication be? In B. R. Burleson (Ed.), *Communication yearbook*, 18, pp. 229-254. Thousand Oaks CA: Sage.

Exhibits

**Exhibit 1: Technical Mappings of Groundwater Management Systems operated by the Department of Groundwater Management, Thailand (Awaiting for Verified Documents from DGR)**

**Exhibit 2: Rationalities used in RC**

Two forms of Rationalities used in Risk Communication involve both technical and Cultural Rationality by Alonzo, Plough and Sheldon Krinsky (1987)

<b>Technical Rationality</b>	<b>Cultural Rationality</b>
Trust in scientific methods, explanation and evidence	Trust in political culture and democratic process
Appeal to authority and expertise	Appeal to folk wisdom, peer groups, and traditions
Boundaries of analysis are narrow and reductionist	Boundaries of analysis are broad, include the use of analogy and historical precedent
Risks are depersonalized	Risks are personalized
Emphasis on statistical variation and probability	Emphasis on the impacts of risks on the family and community
Appeal to consistency and universality	Focus on Particularity; less concerned about consistency and approach
Where there is controversy about science, resolution follows status	Popular responses to scientific differences do not follow the prestige principle
Those impacts that cannot be uttered are irrelevant	Unanticipated or unarticulated risks are relevant

**Exhibit 3: Theoretical distinguishing features of Risk Communication and Crisis Communication by Alonzo, Plough and Sheldon Krinsky (1987)**

<b>Risk Communication</b>	<b>Crisis Communication</b>
Messages regarding known probabilities of negative consequences and how they may be reduced; addressing technical understanding (Hazards) and cultural beliefs	Messages regarding current state or conditions regarding a specific event; magnitude, immediacy duration and control, remediation, cause, consequences
Principally persuasive, i.e., public educational programs	Principally informative;
Frequently, routine	Infrequent, non-routine
Sender/message centered	Receiver/situation centered
Based on what currently is known	Based on what is known and what is not known
Long-termed	Short-termed
Technical experts, scientists	Personal, community, or regional scope
Controlled and structured	Spontaneous and reactive

**Exhibit 4: Participation**

Pretty, J. (1995). Regenerating agriculture, policies and practices for self-sustainability, London: Earthscan.

- **Functional Participation:** People participate by forming groups to meet predetermined objectives related to the project, which can involve the development or promotion of externally initiated social organization. Such involvement tends to come after major decisions have been made, rather than during the planning stage.
- **Interactive Participation:** people participate in joint analysis, which leads to action plans and the formation of new local institutions or the strengthening of existing ones. It tends to involve interdisciplinary methodologies that seek multiple perspectives and make use of systematic and structured learning processes. These groups have control over local decisions, and so people have a stake in maintaining structures or practices.

- **Self-Mobilization:** People participate by taking initiatives independent of external institutions to change systems. They develop contacts with external institutions for resources and technical advice they need, but retain control over how resources are used. Self-initiated mobilization and collective action may or may not challenge existing inequitable distributions of wealth and power.