

## Solving the Problem of Urban River Pollution: Protect the River from the Headwater and Restore the Ecosystem

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## ***I. The Challenges in Controlling Pollution in Chengdu's Funan River***

The importance of water to human beings is beyond all doubt. However, with China's rapid urbanization, the imbalance between water supply and demand in urban areas has intensified. In addition, the issue is made more complex due to water pollution. A river basin's ecological environmental problems have become a massive challenge to China's sustainable development.

Since 1993, the government of Chengdu city, in Sichuan province, has begun to emphasize environment protection, in addition to economic development, and hence has taken measures to recover the Funan River from severe pollution. Funan River flows through the city, and it is the most important water resource of the city. In the past ten years, the Chengdu government has spent ¥20 (US \$ 3.4) billion trying to clean it up, but it has not achieved a desirable outcome due to the limitation of technology and insufficient participation of many stakeholders. Experts have found that the river cannot be recovered unless the city's factories change their production methods and the citizens change their life style.

River protection and water development have been complex issues in the environmental protection field. As a Non-governmental organization (NGO) specializing in river protection, which is rare in China, the Chengdu Urban Rivers Association (CURA) has explored a new approach to controlling pollution in Chengdu's urban rivers, and it has accomplished broadly acknowledged results. This case

study will first describe the CURA's innovative work; then summarize and analyze its motivations, environment factors, and lessons; and conclude with a discussion of implications.

## ***II. Case Description***

### ***1. Brief Introduction of CURA***

CURA was initiated by a team (i.e., experts, scholars, and staff) of the Funan River Comprehensive Renovation Project (FRCRP) on June 5<sup>th</sup>, 2003, and it was funded by the Chengdu government. Over that time, CURA has developed a stable professional team and a volunteer team composed of college and high school students and retired people. CURA has 15 employees, both full-time and part-time. With the guidance of its mission, this organization's major tasks include: getting involved in research projects and participating in environmental protection activities. In addition, CURA educates and provides policy suggestions to the government and environmental information to the general public. CURA has conducted a variety of projects, including research projects on water resource and environmental protection, rural environment education and protection, ecological planning in Anlong village (in Ande town, Pi county, a rural area near Chengdu), the Anlong sustainable development model village project, Minjiang Forum, Sichuan youth volunteers training program, and community cultural cultivation on environmental protection.

### ***2. Anlong Sustainable Development Model Village Project***

This paper will focus on the

Anlong sustainable development model village project (located upstream on the Funan River 15 miles north of Chengdu) to analyze CURA's innovative approach in urban river governance.

In the process of controlling Funan River's pollution, especially the reach running through the city, CURA found that the pollution of the river upstream, which is in a rural area, was severe, and the key work was to rebuild the community's ecological system. Therefore, the rural area's production mode and life style had to be changed, and recycling resources and promoting mutual assistance between urban and rural areas were determined to be the fundamental measures to solve the problem. Based on this decision, CURA and the government of Ande town co-initiated the Anlong sustainable development model village project in Anlong village in 2005.

CURA has aimed to explore a systematic solution for the rural area's source pollution in Anlong village. The attempt is to return to traditional agricultural production methods and create a model, extend it to broader areas, and finally construct a river protection belt along the river bank. CURA utilizes a pollution free-closed circuit ecological resource system to prevent the pollution in Anlong village.

Investigations have shown that 60% of an average Chinese urban river's pollution comes from upstream rural areas, most of which is from chemical fertilizers, extensive use of which has not only polluted rivers but also hardened the land. Generally, only 20-30% of 1 kg of chemical fertilizer can be absorbed by the ground/land, and the

rest of it often flows into rivers. To alleviate pollution from pesticides and chemical fertilizers, CURA introduced the Community Support Agriculture (CSA) model to Anlong village in 2005.

CURA's CSA demonstration started by promoting biogas domestic waste digester in the village. To motivate the villagers to use it, CURA provided ¥ 500 to households as compensation if they built an 8-cubic meter biogas digester on their land. This biogas digester can produce 4,745 kg of biogas residue and biogas slurry, and save 1,024 kg fuel wood, which can save 0.22 hectare of woodland a year. The second step is to renovate a household's kitchen and bathroom. CURA invited Huang Shida, a designer famous for designing a Water Purification System for Chengdu Hushui Park, to design a micro water purification system for courtyards in rural households. To deal with the sewage created in the home, a hydrophyte filter bed (HFB) with gravel inside is built in the courtyard and connected to a waste water pipe. Plants with extensive root systems such as reeds and garland-flower are planted in the HFB to absorb and degrade toxic substances in the waste water. After treatment, the water can be used to irrigate farmland. In addition, the clean fertilizer produced by the biogas digester and the recyclable garbage can be gathered to form organic fertilizers to benefit agricultural production.

Based on the preparations mentioned above, CURA encouraged villagers to take the organic agriculture approach and abandon their previous farming methods, which relied heavily on pesticides

and chemical fertilizers. Organic agriculture is the key link to the close circuit system: It can take advantage of the clean fertilizer created by the biogas digester, the organic fertilizer produced by the recoverable garbage, and the waste water treated by the HFB. Meanwhile, CURA's most important objective is to help the villagers increase their income through promoting organic agriculture. The aim is to build a bridge between consumers and farmers and thus achieve comprehensive goals, including safe food and the sustainability of economic, societal, and natural environmental processes through CSA practice. In other words, it is to tap the market of organic food to improve the villagers' livelihood via contract farming with consumers who are generally living in urban areas.

In March 2006, with CURA's encouragement, five households in Anlong village first engaged in a trial to return to traditional agricultural production, which is an ecological planting approach that does not use pesticides and chemical fertilizers, does not plant counter-seasonal vegetables and fruits, attract birds and earthworms back to the farmland to eat injurious insects, and thus returns the land back to a natural biologic chain.

With regard to the marketing pattern, Anlong village's organic agricultural products have adopted direct selling from farmer households to customers living in Chengdu city, in accordance with specific times and locations. Generally, a villager seller delivers vegetables and other agricultural products one or two times a week to a corresponding consumer's home. Alt-

hough, the price is higher than regular food, Anlong's organic and green food's client base is gradually expanding due to existing consumers' recommendations to their friends and acquaintances.

In the past 7 years, with the help and encouragement of CURA, village households participating in the organic planting and CSA demonstration have reached 11. And as the client base has gradually expanded, the engaged households started to make up the early deficits and profits were achieved. In addition, after the first group of households demonstrated success, CSA's value became broadly accepted by the villagers. Especially, the local governing committee of the village changed their original disinterested attitude and started to provide support for the demonstration program. It is fair to say that the Anlong sustainable development model village project not only experimented with an organic agriculture mode, helping the engaged villagers to increase their income, but also exerted positive impacts on the downstream river's pollution control via the improvement in the village's ecological environment, which is discussed below.

### ***III. The Innovative Approach of Anlong Sustainable Development Model Village Project***

Differing from most NGOs in China, CURA has some ties with the government, while making all efforts to maintain its independence. Due to CURA's operation autonomy, its close communication with international resources, and its expert volunteers, it initiated many innovative ideas and practices,

which will be summarized below.

First, CURA proposed a comprehensive program and figured out a systematic solution to protect the headwater area. Environment protection cannot be achieved if we solely focus on the issue itself, the sustainability of a good environment can only be accomplished through a comprehensive method dealing with economic, social, and environmental problems together. The innovation of CURA lies in its holistic strategy, which starts from improving the ecosystem upstream of the major rivers flowing through Chengdu city. The project successfully controlled Anlong Village's living and production pollution, and exerted significant impacts on public policy, which calls for plans to establish more ecological demonstration areas in order to solve the problem of urban water pollution and protect water resources. The most important innovation is that instead of solely educating rural residents to protect the environment, CURA combines environmental protection and rural development, achieving both goals via helping villagers to develop organic agriculture.

Second, the project formed a positive ecosystem in the village. With the belief that there is no waste in the world, only resources used in a wrong place, CURA helped villagers achieve a recyclable ecosystem. CURA introduced the concept of an ecosystem in nature, helping Anlong villagers to create an ecological neighborhood via biogas digesters, a new type of bathrooms, and a sewage treatment system. After continuous efforts over time, the villagers gradually accepted the

new approach of agriculture that CURA encouraged, which includes using less chemical fertilizers, irrigating with treated sewage, treating manure with biogas digesters to generate energy and organic fertilizers, and using less detergent. As a result, organic vegetables and healthy meat produced by Anlong village became popular products in the market, and a pollution-free ecological circuit system was gradually formed in Anlong village after 7 years' efforts. Also, villagers' planting approach and life style have changed a lot. One villager said: "Now, in addition to the reputation of our village's organic food, the river is getting cleaner, rabbits and egrets are coming back, and people are littering less and less."

Third, the project paid much attention to changing villagers' thoughts and behaviors from the beginning, which turned out to be the key in the implementation of the project. To date, with continuous education, Anlong villagers' environmental protection awareness has been highly enhanced, a new type of living style and a new approach of production have been established among Anlong villagers over the past 7 years, creating many new environmental developments, such as garbage classification and organic farming, which would be impossible to achieve in other places. The establishment of "Filed with Hope organic plantation" (FH) is one typical example. FH was a monthly philanthropic event initiated by volunteers that provided a platform for communication between organic farmers and organic food consumers. Consumers can know more about the farmers' farming and production and buy

healthy food from the farmers' lands via this event. This face-to-face communication between the two enhances mutual trust, creates a new advertising platform for the farmers, and popularizes a sustainable living style and environmental protection awareness to general public.

Fourth, a community participation mode in environment protection has been achieved. CURA helped organize a regular meeting, the Farmer's Forum, a villagers' council that facilitated the villagers' communication with urban resources such as environmental organizations and practitioners, which brought in many more advanced environmental protection ideas and technologies. Based on Anlong village's current situation, one can tell that an environment protection chain has been forming. Many environmentalists think that Anlong's environmental protection practice is at a leading level in China, and its experiences are valuable as a model for other rural areas, especially those located within river basins. Anlong village's case also shows that as long as we can successfully integrate rural environmental protection with villagers' health and financial benefits, the villagers not only can accept the idea of environmental protection but also will positively get involved in protection actions.

Fifth, the project has mobilized many stakeholders and integrated multiple resources, including the local government, Anlong village residents, organic food consumers in Chengdu city, the villagers who engaged in the organic food planting, and the project's financial supporter – Partnerships for

Community Development (PCD) in Hong Kong. (1) CURA's cooperation with the local government and Anlong village residents. The good relationship between CURA and the government of Ande town is the prerequisite of the project in Anlong village. Without the government's support, it would be very difficult for CURA to obtain Anlong villagers' trust to conduct a project in the community. CURA made many efforts to mobilize the villagers to conduct ecological farming, protect the river, and increase their incomes through the projects. For example, villager Gao and his wife started to conduct organic farming in 2006, and achieved enhancement in planting capacity and household income soon. Then, their daughter Gao Qingrong decided to give up her job in an eastern big city and move back to the village to participate in organic farming. She also bought a van to delivery their organic products to Chengdu city. In 2008, Gao's household income increased to 40,000 ¥ (about \$7,000). After that, Gao's two sons also planned to go back to the village and do organic farming with their parents. Farmer Gao's successful experiences in organic farming produced a significant positive impact on other villagers and obtained high attention from many media outlets of Pi county and Chengdu city. (2). CURA's cooperation with consumers. On one hand, consumers have access to reliable organic food through the platform created by CURA; on the other hand, CURA achieved its environmental protection aim through consumers' support of organic agriculture. Other than consuming organic food, con-

sumers also initiatively recommended it to other consumers and actively participated in various activities held by ASDMVP, which helps to unite and expand its consumer group. (3) CURA's collaboration with PCD. The PCD explored and accumulated its local project experiences in the Chengdu plain area; on the hand, the project members learned many more advanced community development approaches via cooperation with PCD, and obtained its financial assistance. This project is the first organic agriculture project that PCD sponsors in the Chengdu area, and it is also the first organic agriculture project in the area initiated by NPO. The collaboration between the two explored some important experiences in an urban community supporting agriculture.

#### ***IV. Innovative Outcomes of Anlong Sustainable Development Model Village Project***

Over many years of innovative practices, the project has achieved significant results and has had broad social impacts.

##### ***1. Direct Outcomes***

Firstly, Anlong village's environment has been evidently improved. To date, the project has built the Pollution Free-Resource Saved-Closed Circuit Ecological System for 160 households. As of this writing, 47.5 tons of manure and 189.8 tons of urine have been treated and transferred to clean fertilizer; 5,694 tons of water has been saved; and 11,388 tons of waste water has been treated and used in farmland irrigation. In addition, 9 of the 11 households have not used

any chemical fertilizers and pesticides for 9 years under CURA's encouragement and support, and 2.6 hectares of organic produce has been planted.

Secondly, Anlong village's ecological environment has been restored to a large extent. In 2010, the Chengdu Bird Watching Association observed 32 kinds of birds in the village. Almost 100 rare *Luciola fictas* were noted. Consequently, the project has earned varieties of environmental awards, including at national and international levels, and the village was selected as a national eco-village model. Moreover, CURA and the World Wild Foundation (WWF) have set up water environment education centers in the village to better fulfill its education and demonstration functions.

Thirdly, the project founded a "Green Consumption Alliance," which is an urban network of organic consumption groups of people in the Chengdu area. The Alliance has mobilized and connected more than 2,000 urban volunteers as consumers. Over 100 urban families joined the "Urban Farmer Group," which is composed of city residents who are interested in farming during their spare time. Communication between rural and urban residents has been enhanced by the Alliance, which has largely promoted environmental protection awareness among both groups.

Fourthly, the villagers' self-development capacity has been enhanced. The project spent much energy on cultivating the community producers' health and cooperation. In addition, the villagers' ability to learn about and solve market activity problems has been increased in

the process of cooperating with their consumers. They are now able to continue their organic food producing and selling by themselves.

Finally, trust between the urban and the rural residents has been re-established as the projects's urban consumers and village organic food providers have cooperated with one another. Some villagers often invite their urban consumer friends to taste their new rice in the fall or organic pork in the Spring Festival.

## **2. Social Impacts**

The project and Anlong village have been covered by over 10 influential media outlets, including the Sichuan TV at the local level, the China Central Television (CCTV) at the national level, and the New York Times at the international level. Meanwhile, at least two communication or training events are held in Anlong village every week to meet the needs of visitors coming from other areas of China or other countries. The project has also been a platform for research and education. Anlong village now is the research and student practice base for a number of universities and high schools in Sichuan province. The project's policy implications are significant, too. The Sichuan government and the Chengdu government have provided Anlong village many non-financial supports. In addition, Anlong village was chosen by the Chengdu government as its key promotion project in 2010.

## **V. Case Analysis:**

### **1. Motivation of Innovation**

#### **A. The Values and Commitment**

#### **of CURA's Leader**

CURA's continuous innovation in the project is closely related to its leader —Tian Jun. Tian was a news editor at first, working for various newspapers and TV stations for a long time. She was deeply concerned by Funan River's severe pollution when working for the Liaison Department of the Funan River Comprehensive Renovation Project. She started to realize that the river's pollution could not be controlled without alleviating the drainage basin's pollution. Tian continued the working after the FRCRP ended in 2005 through her commitment to environment protection. She gave up the opportunity to live a relaxed life in her retirement after a successful career as a media worker and government official, devoting herself to work as a full-time NGO leader. It is her commitment to river governance and environment protection that keeps motivating her to make CURA focus on figuring out innovative solutions for the work.

#### **B. The Practical Needs of River Protection**

After fifty years of China's large-scale river exploitation, people have finally realized the importance and necessity of river governance. However, river management has been held separately in many stakeholders' hands, which does not fit the systematic character of river ecosystem. Therefore, cooperation among different government departments and different regions and sectors is essential. Furthermore, comprehensive works in the river's upstream area and downstream are both important. Based on this awareness, CURA initiated

a project that mobilized resources from both government and non-governmental organizations, facilitated broad participation, and hence formed a comprehensive solution to protect the river.

#### **C. The Demand of Rural Area Environment Protection**

The environmental crisis in China's rural area has been increasingly revealed. Rural residents often lack the broader knowledge of ecological balance and a sustainable economy, but are aware of rural environment pollution, especially the extensive amount of poisonous waste material in their villages. Due to the limitation of a village's public funds, expenditures in rural environment protection have been extremely insufficient. Meanwhile, due to the increasing trend of villagers living closer together in more centralized housing complexes, villagers' demand for environmental control is pressing. In this background, rural residents have to figure out some innovative ways, such as using biogas, to respond to the environment crisis on their own. This demand provides an opportunity for the engagement of NGOs to work on environmental issues.

## **2. Environmental Factors of the Innovation**

### **A. The cooperation and mutual dependence in achieving the aims of both**

The most crucial stakeholder in NPO's river protection project is the local government, which directly influences whether the organization has access to the community. Since its foundation, CURA conducted a variety of projects, such as rural environmental education, con-

trol of urban area pollution in rivers, the sustainable development demonstration village in Funan river's upstream, and Baitiao river protection action, all of which could not be put into practice without the support of local governments. Since CURA has common objectives and missions with the government in river protection, its community-based projects could supplement the government's river control projects. CURA's founders have good relationships with the government, and it has formed a close partnership with many local governments, providing good preparations for its innovative projects in many communities.

### **B. Balancing villagers' interests and environment protection**

From the implementation of the project, one can tell that the prerequisite of the project's success is to protect an ecological environment, but also to ensure the villagers' actual interests from environmental protection. The Anlong village's residents are the targets of this environmental protection propaganda, and are the direct builders of their ecosystem. The project's implementation relies highly on the local residents' awareness of ecological and environmental problems and their appreciation and support. And to gain the residents' acknowledgement and support, the project has to help develop a green economy to benefit the villagers. Only by doing so, the project can attract more and more villagers to participate. A pure environmental protection or river control project is very difficult to sustain.

### **C. Ample external resources**

Ample resources are crucial to an organization's capacity to sustainably innovate. The inner resources such as those mobilized via the founders' impacts and social networks are not able to ensure a NPO's survival and development. The organization needs support of funding, technologies, skills, and volunteers from other organizations or sectors. Undoubtedly, CURA's sustainable innovation is closely related to its external resources, such as sufficient funding from the World Wild Foundation, the Water Protection Association in the United States, the Fuping Development Institute, the Microsoft Corporation, and media support. Because media often is supportive of environmental protection, and due to Tianjun's working experiences in a media outlet, CURA has a good relationship with media too, which provides various propaganda and popularization platforms for its innovation projects. Moreover, CURA possesses rich human resources due to its high emphasis on gathering professional people. For example, its expert group is composed of many senior engineers retired from various departments, which acts as a think tank, providing innovative designs for CURA's river protection activities. In addition, CURA also establishes and maintains an active network with environmental protection associations in many universities in Chengdu city. College students that are supportive of environmental protection make up a large group and are often highly passionate. They play an important role in the project, such as holding activities in Anlong village every Labor Day and National Day and helping with the project in the sum-

mer.

### **3. CURA's own innovative experiences**

As an Environmental NPO specializing in river protection, which is very rare, CURA accumulated many successful experiences since its foundation such as its rational project design, the idea of integrating urban and rural areas, and its emphasis on villagers' capacity building.

#### **A. Rational project design to meet existing demands.**

CURA proposed the notion of "Safe Agriculture, Harmonious Rural Area, Contented Villagers", to respond to the central government's highly emphasized aim to solve the problem of "Agriculture, Rural Area, and Peasants". The livelihood of villagers and the development of agriculture have an intrinsically close relationship with water resource protection. In designing the project, CURA proposed a comprehensive plan to combine water environmental protection and rural residents' livelihood through integrating advanced environmental protection technologies with local wisdom and culture. The continued success of the project could provide experiences for rural pollution control in other areas, and could help to conserve the Chengdu Plain area's natural environment and the special production and life styles formed in this environment.

#### **B. Emphasis on urban-rural-coordination**

As a model to coordinate urban and rural development, Chengdu city has to attract peasants, the main population of rural areas, to

participate in the system to avoid using urban governance's approach in rural governance and developing the rural areas with a method of developing urban areas. The development of rural areas only can be achieved through an improvement of peasants' livelihood and their continuous investment in their own land because they are the masters and friends of their lands. A healthy urban-rural coordination should be based on rural construction, rural economic development, and rural culture, which is to protect rural environment rather than exploit rural resources to obtain short-term interests.

### **C. Sufficient attention to villagers' capacity building**

Obviously, villagers' capacity, which includes labor skills, cognitive ability, and entrepreneurship, is key to river control and urban-rural coordination, since this represents the inner force to achieve these social goals. Although they often do not have high level of education, they are not lacking in wisdom. According to CURA's experiences in conducting projects with villagers, villagers often could actively participate in skills trainings based on their own demands for self-development, but are less likely to do so in knowledge trainings. As a result, CURA developed many approaches such as mobilizing participation and increasing interactions to make the training more interesting to ensure good training effects.

## ***VI. Conclusions and Suggestions***

The exploration of a comprehensive approach for river governance is the most innovative and effective part of CURA's work. And

its emphasis on controlling pollution from the water source is key to the significant effects the project achieved. The project also indicates that NGOs can play a critical role in making social administration more innovative due to their unique advantages over market forces and government power. In addition, CURA's mission and innovative approach in river governance represented valuable knowledge that can be utilized in future projects

# China NGO Case Study Series - 3

December 2013

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