



# The Red Flag Canal: a socio-ecological practice miracle from serendipity, through impossibility, to reality

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## Abstract

This showcase article presents a 50-year-old, 1500-km-long irrigation canal in China as an exemplary case of socio-ecological practice. With a focus on its genesis, the article is the first of a mini-series on one of the best kept secrets in the history of socio-ecological practice.

**Keywords** The Red Flag Canal · China · Common-pool resource (CPR) · Irrigation canal · Irrigation system · Irrigated farmland · Socio-ecological practice · Ecophronesis · Moral improvisation

To the Linxian people of the 1960s who created  
a miracle with half a million pairs of hands

## 1 A miracle of self-reliant, diligent, and ecophronetic socio-ecological practice

July 6, 1969, is a memorable day to the people of the Linxian County (林县) in Henan Province, China.<sup>1</sup> On that very day, they celebrated the completion of the Red Flag Canal (红旗渠). This 1500-km-long irrigation canal transfers precious lifesaving water from the Zhuozhang River (浊漳河) in the neighbor Pingshun County (平顺县) to their arid hometown (Fig. 1). It provides drinking water to the people and domestic animals, and irrigates farmland (Wang and Sang 1995, p. 318). In this remote mountainous region where widespread

poverty and poor agriculture productivity had long been imputed to both the dearth of drinking water supply and scarcity of irrigated farmland, the introduction and provision of these two primary services are historic and revolutionary.<sup>2</sup> Not only did they change the half a million people's lives forever, but also shaped the well-being of all their posterity (Hao et al. 2011, p. 261; Wang and Sang 1995, p. 4).

The completion of the Red Flag Canal is an extraordinary human achievement—so much so that, in 1971, the then Chinese Premier Zhou Enlai [周恩来 (1898—1976)] praised it as a miracle:

There are two miracles of engineering in the modern-day China that people created with self-reliance and diligence, one is the Nanjing Yangtze River Bridge,<sup>3</sup>

<sup>1</sup> On January 24, 1994, the Linxian County became the Linzhou City (林州市) [Hao et al. 2011, p. 393]. In the literature about the history of the Red Flag Canal, however, the authors continue using the historical name “the Linxian County”. This article follows that convention for consistency and uses the present name “the Linzhou City” only when necessary. In 1969, the county's population is 0.55 million; according to the 2017 census, the city's population is 1.16 million (the Linzhou City government Web site <http://www.linzhou.gov.cn/>, accessed September 7, 2019).

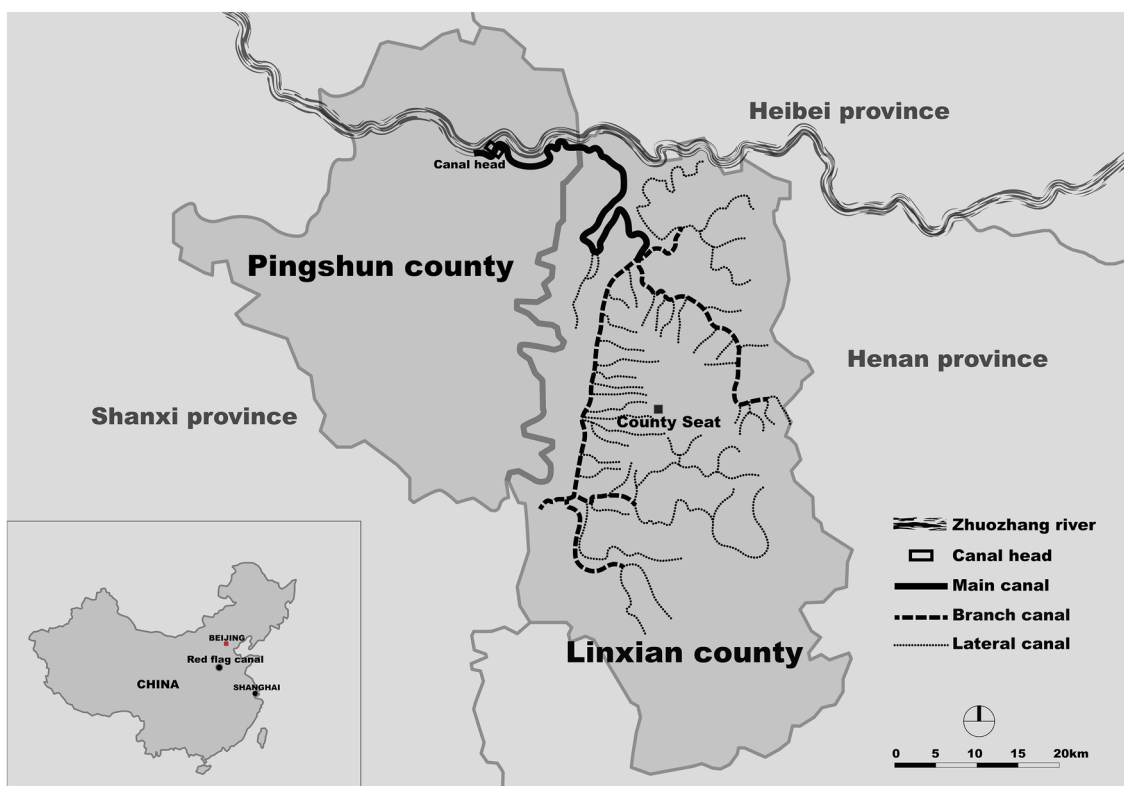
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<sup>2</sup> About the historic, revolutionary differences the Red Flag Canal made in overcoming the severe conditions of drinking water supply and the lack of irrigated farmland, historians Hongmin Wang (王宏民) and Jilu Sang (桑继录) provide telling statistics in their 1995 book *A history of the Red Flag Canal* (in Chinese). Before the canal's completion, there was no sustained drinking water supply in 307 of the county's 550 villages. People in these villages had to make daily or weekly round trips, ranging from 2.5 to 20 km, to get drinking water in water barrels (Wang and Sang 1995, p. 10); after the completion, 410 villages, including all the 307 above-mentioned, benefited from the sustained drinking water supply from the canal (*ibid.*, p. 4, p. 318). In 1959, 21.8% of the county's 65,667 hectares of farmland (14,333 hectares) was irrigated farmland (*ibid.*, p. 19)—already an improvement from 1949 when only 1.3% of the county's farmland (827 hectares) was irrigated farmland (*ibid.*, p. 8); after the canal's completion, another 37,267 hectares became irrigated farmland, making 78.6% of the county's farmland irrigated farmland (*ibid.*, p. 318).

<sup>3</sup> The bridge is the first heavy bridge Chinese engineers designed and built. It was completed and open for traffic in 1968.



**Fig. 1** A location map of the Red Flag Canal, China

and the other the Red Flag Canal in the Linxian County (Zhou 1971, quoted by Hao et al. 2011, p. 272; English translation by the author).

The completion of the Red Flag Canal is indeed a miracle. It is an otherwise impossibility the Linxian people brought into reality through a decadal process of self-reliant, diligent, and ecophronetic socio-ecological practice (Hao et al. 2011, p. 169).<sup>4</sup>

<sup>4</sup> “Socio-ecological practice is the human action and social process that take place in specific socio-ecological context to bring about a secure, harmonious, and sustainable socio-ecological condition serving human beings’ need for survival, development, and flourishing. It ... includes six distinct yet intertwining classes of human action and social process—planning, design, construction, restoration, conservation, and management” (Xiang 2019a, p. 8). Ecophronetic is the adjective of the term *ecophronesis*—ecological practical wisdom (Xiang 2016; Austin 2018). According to Xiang (2016, p. 55), “*ecophronesis* is the master skill par excellence of moral improvisation to make, and act well upon, right choices in any given circumstance of (socio-)ecological practice; motivated by human beings’ enlightened self-interest, it is developed through reflective (socio-)ecological practice” [the addition of “(socio-)” by the author].

### 1.1 A reality created by “half a million pairs of hands”<sup>5</sup>

According to historians Hongmin Wang and Jilu Sang, the canal’s planning, design, construction, project management, and institutional arrangements were all undertaken and completed by the Linxian people themselves with their own diligent efforts, local talents, and available resources (Wang and Sang 1995, pp. 7–176). During the ten-year period of the project (1960–1969), the Linxian people supplied willingly a total of 37,402,000 person-days for the completion of the canal (*ibid*, p. 96).<sup>6</sup> The vast majority of project

<sup>5</sup> The metaphoric expression “half a million pairs of hands” is an English translation of the Chinese clause “55万人民55万双手,” Historian Jiansheng Hao (郝建生) and his coauthor colleagues used to praise the Linxian people’s miracle-making endeavor (Hao et al 2011, p. 169). It figuratively refers to both the enthusiastic, voluntary participation of the Linxian people and the primitive equipment and building materials they made themselves and used in the canal project. These include, but are not limited to, shovels, pickaxes, hammers, chisels, wheel borrows, gunpowder, cements, and lime (Hao et al 2011, pp. 169–172; Wang and Sang 1995, pp. 168–176).

<sup>6</sup> In her 1990 book entitled *Governing the commons*, the 2009 winner of the Nobel Prize in Economics, American economist Elinor Ostrom (1933–2012) commends the high level of attendance of the local volunteers in the *zanjera* irrigation communities in the Phil-

expenditures were funded locally—30% of the total project cost,<sup>7</sup> 20 million out of 68.7 million renminbi (RMB), was covered jointly by the county, the local people's communes, and brigades<sup>8</sup>; 55% (37.4 million RMB), primarily professional (labor) compensations and equipment, was covered voluntarily by the Linxian people, mostly farmers<sup>9</sup>; and the rest (15%) was covered by the provincial and central governments (*ibid.*, p. 95).<sup>10</sup>

Footnote 6 (continued)

ippines. She writes (Ostrom 1990, p. 86): “In terms of the contemporary schedule of 5 days per week, this (level of attendance—the author) amounts to 2 months of work supplied without direct monetary payment. About 16,000 man-days were supplied by members to their own *zanjera* or federation during the year. As Siy (Robert Siy is the scholar who studied and reported the *zanjera* irrigation communities—the author) reflects, ‘there are definitely few rural organizations in the developing world which have been able to regularly mobilize voluntary (sic) labor to such extent’ (Siy 1982, p. 95). Given the rigorous and at times dangerous nature of the work, the level of attendance at these obligatory sessions is rather amazing.” Both Ostrom and Siy would have been even more impressed with the level of attendance in the Red Flag Canal project and eager to find out the reasons (see footnote 9).

<sup>7</sup> Project cost is “the total cost of a project including professional compensation, land costs, furnishings and equipment, financing and other charges, as well as the construction cost” (Harris 2006, p. 768).

<sup>8</sup> “DURING THE TWENTY YEARS (sic—the author) from 1958 to 1978, the framework for rural development throughout China was provided by the people's commune, a structure with a ‘three-level system of ownership with the production team as its basis’ (the English translation of ‘三级所有,队为基础’—the author). In the vast majority of communes, the ownership of land, labour, basic farming implements, and animals was vested in the team level, a unit with an average population of fewer than 170 people. The team managed the farming tasks and formed the unit of account for calculating and dividing income. At successively higher levels of organization, the brigade and the commune provided inputs of larger machinery and water resources, general management, and overall planning. Depending on the quality of leadership and available resources, the latter two levels also accumulated the funds to invest in infrastructure, subsidiary undertakings, and small industries. In addition, the commune formed the basis for governmental administration in the countryside. It absorbed the functions of the old *xiang* (township) and took most of the responsibility for the provision of welfare services, education, public security, and so forth” (O’Leary and Watson 1982, p. 593).

<sup>9</sup> How could this high level of voluntary contributions be possible? How could the high level of voluntary attendance (i.e., the above-mentioned 37,402,000 person-days supplied voluntarily by the Linxian people) be possible? In a 2004 book entitled *China’s Red Flag Canal: its resource background and institutional arrangements* (in Chinese), resource economist Luliang Li (李露亮) and his coauthor colleagues attribute both remarkable phenomena to the self-motivation of the Linxian people, the effective project management, and a set of unique, pragmatic institutional rules the project leadership team devised and implemented (Li et al 2004, pp. 94–103). These will be the topic of a latter article for this journal.

<sup>10</sup> The technical support and financial assistance from the provincial and central governments helped improve the project quality and efficiency significantly (Wang and Sang 1995, p. 118). They, however, did not come until 1964, the fifth year into the project, after the Linx-

## 1.2 An otherwise impossible mission

While working voluntarily on the canal project, the Linxian people endured involuntarily many extreme ecological, economic, and political hardships, each of which alone could have made the mission impossible (Wang and Sang 1995, pp. 32–99). These hardships include, but are not limited to, those associated with the country’s “Three years of economic difficulty” (1959–1961) and “Cultural revolution” (1966–1976) [as described by Guo (2018, pp. 40–41), Hao et al. (2011, pp. 156–175, pp. 256–259), Wang and Sang (1995, pp. 32–99), Wang et al. (1998, pp. 43–105), and Yang (1995, pp. 466–476)]. To the Linxian people, however, hardships are blessings in disguise for their life-changing endeavor (Wang et al. 1998, pp. 109–110; Yang 1995, p. 477). With unyielding courage and ecophronetic skills of moral improvisation (the concept and an instance of moral improvisation are provided in the next section), they overcame the myriad of extreme hardships and eventually brought the canal into being (Wang and Sang 1995, pp. 32–99).

## 2 A gift of hardship in a year of misfortune and frustration

Every human achievement has its beginning in an idea (Hill 1937, p. xi).<sup>11</sup> The completion of the Red Flag Canal is no exception. The fountainhead of Linxian people’s miracle-making endeavor is a bold idea that they believed in and were committed to throughout the entire project. Interestingly enough, like the completion of the canal, this idea is also a gift of hardship (Hao et al. 2011, p. 118; Yang 1995, pp. 464–465).

### 2.1 A blessing in disguise

To the Linxian people, 1959 is a year of misfortune. A brutal, injurious drought forcefully interrupted their routine time-sensitive practice of summer crop planting in early June; the concomitant severe shortage of drinking water supplies presented yet another life-threatening hardship (Hao et al. 2011, pp. 116–117; Wang and Sang 1995, pp. 22–23).

To Gui Yang [杨贵(1928—2018)], the county’s manager since 1954, and his colleagues on the county’s leadership team, 1959 is also a year of frustration. Since 1957, the Linxian people had been implementing a county-wide

Footnote 10 (continued)

ian people enlisted successfully the support from the governments in 1963 (Hao et al 2011, p. 182; Wang and Sang 1995, pp. 116–118).

<sup>11</sup> “[A]ll achievement, all earned riches, have their beginning in an idea!” (Hill 1937, p. xi).

waterworks plan the leadership team developed under the guidelines from the central governments (Wang and Sang 1995, pp. 13–20; Yang 1995, pp. 463–464).<sup>12</sup> By the end of 1959, they would have built a county-wide waterworks that consists of 36 reservoirs, 2397 retention ponds, 32,772 wells, and 1364 canals [they did actually build (*ibid.*, p. 19)]. Underlying the plan is the premise that once built, such a county-wide waterworks would meet the needs for drinking and irrigation (Hao et al. 2011, p. 116). But this very premise was now so readily falsified and indifferently rejected by the daunting reality of punishing drought: throughout the entire waterworks, in each and every one of its reservoirs, retention ponds, wells, and canals—whether built or under construction, there was simply little, if any, water at all (Hao et al. 2011, p. 116; Wang and Sang 1995, pp. 22–23; Yang 1995, pp. 464–465).

“The 1959 hardships are truly a blessing in disguise”, reflected Gui Yang several decades later. “Not only did they awaken our minds to the daunting reality of pernicious drought, but they also mandated us to let go of the romantic wishful thinking, and to instead think outside the box” (cited by Hao et al. 2011, p. 118; English translation by the author).

That—to let go of the wishful thinking, and to think outside the box—was exactly how Gui Yang and the county’s leadership team responded to the inexorable hardships of misfortune and frustration. They swiftly took a prudent, decisive action of moral improvisation—to look beyond the county boundary for sustained water resources (Hao et al. 2011, pp. 117–118; Yang 1995, p. 465).<sup>13</sup> On June 13, 1959,

<sup>12</sup> The general guidelines require that agricultural waterworks should be mainly (1) constructed for retaining water from natural precipitations or groundwater; (2) undertaken by the local beneficiaries—people’s communes and brigades—themselves; (3) small in scale, but can be part of a larger system [“(中央的方针是农业水利建设要)以蓄为主,以社队自办为主,以小型为主,大中小型相结合”](Yang 1995, p. 464).

<sup>13</sup> Improvisation, when contextualized differently from improvisational jazz and theatrical performance where it originates, is an extemporaneous action or array of such actions practitioners take to manage unforeseen challenges or to embrace emergent opportunities with available knowledge and resources (Xiang 2016, p. 57). Inherently neither good nor bad, improvisation itself may lead to either positive or negative results (Cunha et al. 1999, pp. 327–332; Vera and Crossan 2005, p. 204). To be prudent and effective, therefore, practitioners need to exercise what American planning scholar John Forester calls “moral improvisation”, improvisation with commitments to generally or traditionally held moral principles, that is (Forester 1999, p. 224). In challenging, unforeseen situations, they act extemporaneously yet mindfully as “moral improvisers” (*ibid.*, p. 236) who are “doubly responsible” (Nussbaum 1990, p. 94)—honoring moral commitments and upholding ethical principles, on the one hand, and attending time-sensitive, circumstantial particulars, on the other. For both Aristotle and American pragmatist William James (1842–1910), “the metaphor of theatrical improvisation ... is a favorite ... image

Gui Yang and a survey crew started their treasure hunt journey along the Zhuozhang River in the neighbor Pingshun County (Hao et al. 2011, p. 119; see also Fig. 1). The next day, they made a serendipitous discovery from which the very idea of the canal project emerged.

## 2.2 A bold idea from a serendipitous discovery

About the emergence of the canal project idea and the instance of serendipity, historian Jiansheng Hao and his coauthor colleagues write in their 2011 book *Gui Yang and the Red Flag Canal* (Hao et al. 2011, pp. 119–121; English translation by the author):

It was June 14th, 1959. Making their way through a deep canyon in the neighbor Pingshun County (see Fig. 1—the author), Gui Yang and his survey crew marveled at the abundant water resources of the Zhuozhang River flowing through the canyon. Gui Yang could not believe what he saw—the large, swirly waves of whitewater on the rapids of the river; he was even more amazed by the massive volume of water supply from the riverhead in a year of severe drought throughout the region.

“Can some of this water be transferred through a canal to our arid hometown for drinking and irrigation?” Spontaneously asked Gui Yang.

The crew wasted no time getting the initial answers:

The Zhuozhang River is a perennial river; and there is ample, continuous streamflow in the river that can sustain a water transfer<sup>14</sup>; despite outside the Zhuozhang River watershed, the basin where the Linxian County is located is downstream from the river, and is lower in elevation than the section of riverbed near the boundaries between the two counties.

Footnote 13 (continued)

for the activity of practical wisdom (phronesis, that is—the author)” (*ibid.*). For American geographer and planning scholar Wei-Ning Xiang, moral improvisation is a hallmark of ecophronesis—ecological practical wisdom (2016, p. 55; see Xiang’s definition of ecophronesis in footnote 4). For a classic, in-depth discussion about “moral improvisation” in the practice of planning, see Chapter 8 of Forester’s 1999 book *The deliberative practitioner: encouraging participatory planning processes* (pp. 221–241); for an updated account, see section 6 in Forester (2019). As no Chinese translation of *moral improvisation* can be found in the published English–Chinese dictionaries, the author translates it tentatively as 因地制宜, 与时偕行.

<sup>14</sup> Streamflow is the amount of water passing through a specific point of a river over time. In Zhuozhang River, the annual average streamflow is 30 cubic meters per second ( $m^3/s$ ), ranging from 7000  $m^3/s$  to 13  $m^3/s$ , the hydrological record that Yang and his crew found shows (Hao et al. 2011, p. 120).

Inspired by this serendipitous discovery, and after much contemplation, in the night of June 15th, Gui Yang returned to the Linxian County with a bold idea in mind—building an irrigation canal to bring the life-saving water in the Zhuozhang River to home.<sup>15</sup>

Ten years later, on July 6, 1969, the idea of water transfer became a materialized reality—the completion of the Red Flag Canal.<sup>16</sup>

### 3 A good, study-worthy social practice

In “There is nothing as theoretical as good practice,” a 1991 editorial published in the journal *Environment and Planning B: Planning and Design*, American geographer and planning scholar Helen Couclelis writes (Couclelis 1991, p. 383):

...[T]he practice has its own rationale, its own theoretical justification ... [H]uman agents (sic—the author) participating in a social practice such as doing geography or doing planning *know* why they do what they do (indeed, they have a *theory* about it), no matter how uninformed and distorted that knowledge might seem from somebody else’s perspective. If the practice is successful (by whatever criterion), then the collective, commonsense knowledge (sic—the author) behind it is worth a closer look by us theoreticians. Good practice *is* theoretical, not in the trivial sense that it inspires, motivates, informs theory, but more literally, in that good practice contains its own theory. So, indeed, “there is nothing as theoretical as good practice.”

The socio-ecological practice of the Linxian people is exemplary of such good, study-worthy social practice. Their self-reliant, diligent, and ecophronetic practice is good, in that not only did it successfully bring the 1959 idea of serendipity, through a myriad of impossibility, to the 1969 miracle completion reality, as presented in this showcase article, but it has also been instrumental ever since in securing canal’s operations as an enduring, beneficial common-pool resource (CPR).<sup>17</sup> Their practice is study-worthy because “its own

theory” possesses both the intrinsic values and ordinary utilities Couclelis describes in the above quote, and therefore exemplifies the body of knowledge ecopracticology, the study of socio-ecological practice, aims to build. (For a discussion on ecopracticological knowledge, see Xiang 2019a, pp. 8–9.) Once systematically unearthed and critically scrutinized, this centerpiece will significantly enrich the emerging field of ecopracticology and ultimately help advance socio-ecological practice.<sup>18</sup>

### 4 A fitting SEPR mini-series

To this end, *Socio-Ecological Practice Research* (SEPR), the home journal of ecopracticology (Xiang 2019a, p. 12), will feature the Red Flag Canal in a mini-series. Following the present showcase, other articles of various types in the mini-series [for the 11 SEPR article types, see Xiang (2019b, pp. 1–4)] will be on different but equally important aspects of the socio-ecological practice pertaining to the canal (e.g., humanity, ecophronesis, science, engineering, ethics, politics, governance, and leadership) and on changes the canal brought about to the people and the place. The mini-series will be several years in the making and will conclude with a synthesis of this best kept secret’s “own theory.”

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<sup>15</sup> The original sentence is “经过一夜思虑,引漳(浊漳河水)入林(县)宏伟构想在杨贵胸中形成了” (Hao et al 2011, p. 121).

<sup>16</sup> The canal’s name is another realized idea of Gui Yang. At an organization meeting on March 6 and 7, 1960, he proposed to name the irrigation canal with a term he coined—“the Red Flag Canal” because, he explained, “the red flag symbolizes social progress and our life-changing endeavor” (Hao et al 2011, p. 141). The proposal was adopted at that meeting, and later approved unanimously by the representatives at the county’s Water Transfer Conference on March 10 (*ibid.*, p. 142).

<sup>17</sup> For references on CPR, see Ostrom (1990, 2008) and Ostrom et al (1994, 1999). An article on the canal as a CPR is under preparation for this journal (see also footnote 9).

<sup>18</sup> As many historians have documented and unveiled [e.g., Guo (2018), Hao et al (2011), Li (1975), Li et al (2004), and Wang et al (1998)], for the Linxian people, “the whole story” of their self-reliant, diligent, and ecophronetic endeavor “is a romance of hardship, daring, and wonderful achievement”, to borrow a phrase from American author George Cary Eggleston (1839–1911) in his 1886 book *Strange stories from history* [Eggleston 2007, p. 19]. While the development of this poetic romance is a valuable work in its own right and still in progress, “a closer look” (Couclelis 1991, p. 383), more systematic and rigorous, into the theory behind “the whole story” is in order.

## Appendix

A photograph of the author (right) with Maijiang Zhang (张买江), taken in the Linzhou City on June 10, 2017. Zhang, whose first name *Maijiang* literally means “buying a river,” participated in the Red Flag Canal project during the 1960s when he was a teenager. He shared many moving stories about the people, the place, and the canal. (Posting of this photo with Maijiang Zhang’s permission.)



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