
Skills' Sets and Shared Benefits: Perceptions of Resettled People from The Yangtze-Huai River Diversion Project in China

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Abstract

Development induced displacement and resettlement (DIDR) projects should share their benefits with those affected by them. This paper shows that in the case of the Yangtze-Huai River Diversion Project in China perceptions of compensation received differs amongst different groups of resettled people even if levels of compensation are similar. Based on a survey with displaced people, a fuzzy comprehensive evaluation concludes that those with generic skills' sets are the most satisfied, mainly because they are able to find new work and re-establish livelihoods after resettlement more quickly. On the other hand, those with only agricultural skills find it difficult to re-establish their livelihood and are often dissatisfied. Finally, those who did not have any work before resettlement were found to be satisfied overall

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as their life quality is said to have improved. The skills of those affected are therefore a key explanatory factor for satisfaction with compensation following resettlement.

Keywords

Development Induced Displacement and Resettlement; Sustainable Livelihoods; Human capital; Benefits sharing

1 Introduction

Since the 1980s many large-scale construction projects were implemented in China. These projects greatly enhanced GDP growth, increased employment and reduced poverty in many areas (Ma & Liu 2015; Wang 2020). However, they have also resulted in millions of people being displaced and resettled. Most of those affected are from rural areas. However, only some of those were resettled to other rural areas, whereas many have found themselves being moved into an urban environment. With rural land becoming increasingly difficult to find for resettlement, the latter is increasingly becoming the norm (Duan & Dou 2016). Whilst in rural to rural resettlement, those affected can continue to be e.g. farmers, in rural to urban resettlement, many are forced to find different ways for earning their livelihoods. Whether or not they are actually able to succeed has attracted some considerable research attention (Cernea 2008; Wang 2012).

Besides struggling with finding work, those being resettled are also frequently faced with problems of social integration (Chen & Shi 2006; Wilmsen et al. 2011; Duan & Dou 2016; Wang et al. 2019). In this context, the need for ensuring those affected are enabled to share the benefits of large-scale projects has been recognised internationally (Shi 1996; MacDonald 2009; Wang 2012; Shang & Shi 2012; Wang 2020). In this context, Cernea (2008) and Jiang et al. (2018) argued that it is insufficient to simply provide for one off cash and housing compensation and that a more long-term strategy is required. It is within this context that in some development induced displacement and resettlement (DIDR) projects, benefit sharing schemes with longer term perspectives have started to be introduced. The idea is that the key stakeholders (central government, local government, project owners, resettlement community)

are assigned an ongoing responsibility for affected people. Benefits to be shared can include financial gains from a project and capital gains. In this context, next to basic cash and housing compensation, improved public infrastructures, social services and social protection can also be considered (Reddy et al. 2017). In China, some innovative forms of benefit sharing have emerged over recent years, such as migrant shareholding systems in which affected migrants become shareholders of the project and receive cash dividends annually after land acquisition (Shang & Shi 2012).

Whilst there are a number of studies on the fiscal performance of resettlement projects and their benefit sharing schemes (Wilmsen 2018a, 2018b; Liu et al. 2019; Wilmsen & Rogers 2019; Rogers et al. 2019), little research has been conducted to date on the perceptions of benefits of those being resettled. It is within this context that the paper aims at filling a knowledge gap by reflecting on whether the shared benefit schemes of the Yangtze-Huai River Diversion Project in Anhui Province, China has benefitted affected people equally. Here, relocation started in 2017 and more than 70,000 rural people were affected due to land acquisition and housing demolitions. They were relocated to both, rural and urban / sub-urban areas.

Subsequently, first a literature is provided on benefit sharing of affected people in DIDR projects. This is followed by the introduction of a theoretical framework on the interaction between human capital and other capitals. Results from a survey on the opinions of 584 resettled people from the Yangtze-Huai River Diversion Project about the benefits received are introduced. A fuzzy comprehensive evaluation model is used to analyse survey results with regards to different types of skills of those being resettled and their perception of shared benefits. In the conclusions, the theoretical contribution and policy implications of the research findings are discussed.

2 Benefit sharing of DIDR projects—a literature review

The professional literature approaches benefit sharing of DIDR projects with different perspectives, including; (a) the need to share benefits among stakeholders; (b) the methods of

benefit sharing; and (c) how to improve the mechanisms of sharing. Subsequently, this is explored further.

Why there is a need for benefit sharing in DIDR projects?

Although the purpose of DIDR projects is to promote economic and social development, they also tend to impose environmental and social costs on the areas they are located in (Price 2009; Zaman & Gonnetilleke 2016). They can lead to a destruction of the original lifestyles and income sources of people, and can disrupt social relations and organizational structures of affected areas. These impacts cannot usually be alleviated by simply making a fixed one-off compensation payment (Kanbur 2003; Peng et al, 2019). Instead, there is a need for an ongoing benefit-sharing mechanism which can help those resettling to restart and sustain their livelihoods in the new resettlement locations (Shi 1996; MacDonald 2009; Wang 2012; Shang & Shi 2012).

Methods of benefit sharing.

Shared benefits can be brought about in many different ways. They can include tax incentives, as well as cash or in-kind compensation payments (Egre et al. 2007; MacDonald 2009; Yan et al. 2018). There have also been suggestions that the use of rights of land resources affected by resettlement could be converted into project investment, and that the benefits of development are shared in the form of e.g. dividends (Zhu & Shi 1995; Shi 1996). This approach is promising, as it helps to turn short term cash compensation into long term cash inflow for affected households. Some have also argued that economic compensation on its own is insufficient (Downing, 2002) and that those being resettled should be entitled to social benefits (Milewski et al. 1999) due to the ensuing negative social impacts (Smyth & Vanclay 2017).

Improvement of benefit sharing mechanisms.

Amongst others, Mokorosi et al. (2007) argued that sustainable benefit sharing mechanisms require project planning to take the interests of affected people into account. In this context, a suitable institutional (including legal and policy) framework needs to be in place, allowing for effective public participation. Benefit-sharing mechanisms need to consider the specific social circumstances of areas affected by projects, including local traditions and culture

(Egre 2007; Downing & Garcia-Downing 2009; Hensengerth et al. 2012; Mahalingam & Vyas 2011; Scheumann et al. 2014). Developers should be obliged to make decisions jointly with local governments and ensure long-term benefit sharing mechanisms between key stakeholders and affected people (Haas & Tung 2007). In this context, it is important to include monitoring and feedback systems (Song 2008, Habich 2015 and Jianliang & Arthur 2015), in particular as those being resettled have been found to lose out to other stakeholders (Xia et al. 2018). Shi G. (1995,1996, 2007, 2008, 2012) introduced nature resources transform theory, which takes land resourcing, land resource capitalization and land capital securitization into account.

Due to a lack of research, it is not clear how well existing benefit sharing systems have performed in China. What is more, not all large infrastructure projects are profitmaking, at least in the short term. This means that even if there is a shareholding system, projects may not deliver dividends to those being resettled. Finally, there is currently little reflection on whether people possess similar abilities to turn shared benefits into effective means of supporting livelihoods. The ability to do so is likely to affect their perception of the benefits they receive.

3 Perceptions of shared benefits in DIDR projects – towards a sustainable livelihoods’ framework

The concept of shared benefits is different from simple compensation in that it is meant to allow people affected by development to benefit from projects in a longer term and help them achieve sustainable livelihoods. What is more, it is not sufficient to just offer “enough money” in order to compensate, but to develop and understanding of how people actually benefit from “shared benefit” schemes.

A sustainable livelihoods’ framework can help to develop an understanding for the challenges forced migrants face. Importantly, people’s livelihoods can be constrained or supported by the level of support provided for five types of capital; human capital, physical capital, social capital, financial capital and natural capital (Bebbington 1999). There are supplements to these five types of capitals that interact with each other, including adequate

infrastructures and public services (Crawford 2008). Failing to provide support to one or more types of capitals may prevent a person from successfully sustaining their livelihoods.

A very practical challenge is to establish whether those being resettled are supported adequately with regards to the five types of capital. Rural to urban migrants cannot normally resort to their old way of life and therefore have to acquire new forms of human capital in order to be employable in urban contexts. Also, forced migrants are likely to behave differently from voluntary migrants in that they may not prepare themselves for urban life before they are resettled. This can lead to them staying unemployed for some time after relocation (Jiang et al. 2018). However, employability is not the only important aspect of human capital, which is also about people being able to engage fruitfully and meaningfully with the world (Sen 1997). Such meaningful engagement (as expressed through e.g. social connections) can be facilitated by access to public infrastructures. In this context, it is important that a person who has no work and no resources to socialise is likely to not appreciate access to well-developed public infrastructures.

Forced migrants from rural areas frequently have to abandon their farming life and re-establish themselves in urban settings. For people who are used to work in order to support their own livelihoods, being able to become part of the labour force in their new place is essential for their wellbeing. Furthermore, being able to participate socially in society gives meaning to people's lives (Stam et al. 2016; De Jong et al. 2002).

Cash and housing compensations can be seen as a form of universal basic income. In theory, people with such income do not need to worry about their basic needs and can do whatever they think is beneficial to them and wider society. However, it is likely that this only works for people who are well integrated into society. Forced migrants frequently have different cultural backgrounds and find themselves trapped in social and spatial segregation (Acharya & Barragán Codina 2012). At worst, they are faced with poverty and become part of a new underclass (Adonis 2016). Therefore, employment is crucial for social integration..

4 Materials and methods

4.1 Study area

In order to examine whether shared benefits are perceived differently by different groups of resettled people, a typology of different skills types of those people is at the heart of our examination. These include “generic skills”, “agriculture-only skills” and “no ability to work”, in line with human capital theory brought forward by Becker (2009). The data used in this research were collected through a survey of rural to urban migrants from the Yangtze-Huai River Diversion Project, a major water resource allocation project with a total length of 723 kilometres, covering 46 areas in 12 cities (see Figure 1). A total area of 70,600 square kilometres is affected by the project. The average annual water diversion volume of the project is 3.303 billion cubic metres, the net water diversion volume is 2.742 billion cubic metres, and the long-term water diversion volume is 4.3 billion cubic metres. The total investment of the Anhui section of the project is 87.537 billion yuan (13 billion US dollars)¹. The land compensation and resettlement subsidies of the project are distributed according to the land compensation standards of Anhui Province.

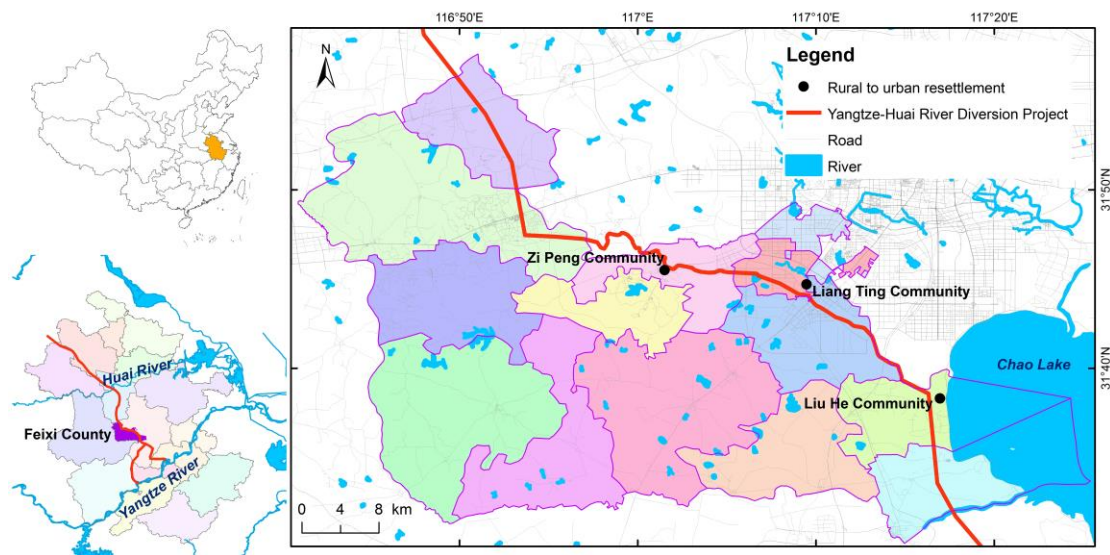


Fig.1 Location of the Yangtze to Huai River Diversion Project; Source: Designed by the authors.

¹ Introduction of the Yangtze to Huai River Diversion project on its official website: http://www.ahyjhh.com.cn/info.asp?base_id=4

Those that are resettled in order to make way for a particular project are referred to as “migrants” in China. These migrants are supposed to receive monetary and non-monetary benefits. Cash compensation includes land compensation and resettlement subsidies. The amount granted is in line with the state regulations on resettlement². Compensation is provided by central and local governments, project owners and host communities.

With regards to the underlying data base, a longitudinal survey was conducted (2017 to 2018) in Jingkai District and Feixi County in Heifei, Anhui Province of those affected and resettled by the Yangtze-Huai River Diversion Project. The survey used stratified random sampling. According to the survey design, participants from all sampled villages and neighbourhoods should fall into different income groups. Sampling rates were set as follows:

- 1) The number of villages and neighbourhoods sampled should be between 5-20% of the total number of villages and neighbourhoods.
- 2) The total number of sampled migrant households should be no less than 5% of the total number of migrant households. If in a village, the sampled members of different households were less than 100, then the research team should increase the sample size to 100. If the total number of households in a village, neighbourhoods or team was less than 100, then all households should be interviewed.

Survey questions included personal and family information, information on income sources, and changes and social adaptation following resettlement. Changes were expressed through objective indicators and subjective indicators³. A total of 1713 respondents were surveyed, of which 584 were rural to urban migrants.

Among rural to urban migrants’ interviewees, 154 people had generic skills, 211 had agricultural skills only and 219 people were not working (e.g. elderly or disabled). 178 interviewees were over 60 years old and 81 were younger than 18 years. More than half of the remaining respondents were young workers. There were 306 male and 278 female respondents.

² *Regulations on land requisition compensation and resettlement for the construction of large and medium-sized water conservancy and hydropower projects of China*, http://www.gov.cn/zhengce/content/2017-05/02/content_5190382.htm

³ Subjective indicators represent respondents' perceptions, such as changes in employment opportunities. Objective indicators represent changes that can be measured explicitly by numerical values, such as the ratio of cash compensation.

268 respondents had primary education or less, 208 were junior high school graduates and 70 were high school graduates, with 38 having college education or more.

4.2 Methods

How rural to urban migrants' experience and perceive shared benefits is a complex system issue. Therefore, the research team decided to conduct a fuzzy comprehensive evaluation. This derives from fuzzy set theory and can be performed by synthesizing performance data and subjective response data (Zhou & Chan 2017) to comprehensively evaluate shared benefits. This means the amount of information utilized is expanded, and as a consequence evaluation results are more credible (Zhang et al. 2017). The model is based on an evaluation vector, appraisal grades, and a fuzzy mapping matrix. These are introduced below.

4.2.1 The set of evaluation indicators

Evaluation can be represented by a vector $V = \{V_1, V_2, \dots, V_6\}$ which combines four types of capitals which have been operationalised into six types of benefits. These are derived from the different types of capitals introduced above, as follows:

- *Employment opportunities* provided by the local state. Here, the state provision is a supplement to the low level of social capital. The supplement continues for more than 5 years.
- *Skills training* provided through local government skills training programs. This is a benefit aiming to contribute to the human capital of the migrant.
- *Public services* can contribute to people's physical capital such as healthcare, and the next generation's human capital such as schools. *Infrastructures* such as road water supply and sewage infrastructures which also contribute to physical capital and access to other forms of capitals.
- *Monetary and in-kind compensations* provided through cash and housing compensation payments. These are financial capitals.

4.2.2 The set of appraisal grades

Appraisal grades are experience or perceived level of shared benefits reported by respondents.

The set can be written as $U = \{u_j, j = 1, 2, \dots, 5 = \{1,2,3,4,5\}$. Where j is the number of levels in the appraisal. Table 1 shows how appraisal grades are allocated to evaluation indicators.

Table 1 Evaluation indicators (V_j) and appraisal grades (U_j)

Shared benefits V_i	Description	Shared benefits (U_i)
Employment Opportunities V_1	Changes in Employment Opportunities after Resettlement	1. Much worse; 2. slightly worse; 3. unchanged; 4. slightly better; 5. much better
Skills Training V_2	Frequency of Free Skills Training after Resettlement	1. Once a year; 2. once a half year; 3. once every three months; 4. once a month; 5. once a week
Public Service V_3	Changes in Public Service Coverage after Resettlement	1. Much worse; 2. slightly worse; 3. unchanged; 4. slightly better; 5. much better
Public Infrastructure V_4	Changes in the Coverage of Public Facilities after Resettlement	1. Much worse; 2. slightly worse; 3. unchanged; 4. slightly better; 5. much better
Cash Compensation V_5	Ratio of Cash Compensation to Annual Income Before Settlement	1. <1; 2. 1-2; 3. 2-3; 4. 3-4; 5. > 4
Housing V_6	Asset Appreciation before and after Resettlement	1. not obvious; 2. 1.2-1.5 times; 3. 1.5-2 times; 4. 2-3 times; 5. 3 times or more

4.2.3 The fuzzy mapping matrix

The evaluation is meant to produce a mapping from V to U . For an appraisal factor V_i , the fuzzy mapping to U can be a matrix $R = \{r_{ij}, i = 1, 2, \dots, 6; j = 1, 2, \dots, 5\}$ where r_{ij} represents the fuzzy membership degree of appraisal factor V_i to U_j .

5 Results and discussions

5.1 Results

In order to reflect the views of the respondents, we used the reported appraisal grade and the proportion of respondents who reported each grade to develop a membership degree⁴.

Membership degrees are then assigned to multiple “fuzzy grades” to compare two evaluation indicators.

⁴ The often-used method to generate the membership degree is based on directly using the researchers' appraisal grade and the degree to which this factor's evaluation belongs to appraisal grade (see e.g. Klawonn, 2006).

Table 2 Fuzzy membership degree

Sharing Benefits		Membership degrees														
Employment Opportunities V₁	Falling a lot (%)	Falling slightly (%)			Unchanged (%)			Rising slightly (%)			Rising a lot (%)					
(Changes in Employment Opportunities after Resettlement)	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3				
	3.25% 54.98% 40.64%	7.79% 21.33% 19.63%	37.01% 15.17% 27.85%	42.86% 5.69% 10.50%	9.09% 2.84% 1.37%											
Skills Training V₂	Once a year (%)	Once a half year (%)			Once a quarter (%)			Once a month (%)			Once a week (%)					
(Frequency of Free Skills Training after Placement)	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3				
	64.29% 63.03% 85.84%	32.47% 31.28% 14.16%	3.25% 5.69% 0.00%	0.00% 0.00% 0.00%	0.00% 0.00% 0.00%	0.00% 0.00% 0.00%	0.00% 0.00% 0.00%	0.00% 0.00% 0.00%	0.00% 0.00% 0.00%	0.00% 0.00% 0.00%	0.00% 0.00% 0.00%	0.00% 0.00% 0.00%				
Public Service V₃	Falling a lot (%)	Falling slightly (%)			Unchanged (%)			Rising slightly (%)			Rising a lot (%)					
(Changes in Public Service Coverage after Resettlement)	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3				
	0.00% 0.00% 0.00%	0.00% 0.00% 0.00%	14.94% 75.83% 25.12%	27.92% 18.48% 45.97%	57.14% 5.69% 28.91%											
Public Infrastructure V₄	Falling a lot (%)	Falling slightly (%)			Unchanged (%)			Rising slightly (%)			Rising a lot (%)					
(Changes in the Coverage of Public Facilities after Resettlement)	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3				
	0.00% 5.69% 5.21%	0.00% 8.06% 8.53%	9.74% 53.08% 28.91%	24.68% 22.27% 53.08%	65.58% 10.90% 4.27%											
Cash Compensation V₅	Less than 1 times (%)	1-2 times (%)			2-3 times (%)			3-4 times (%)			More than 4 times (%)					
(Ratio of Cash Compensation to Annual Income Before Settlement)	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3				
	22.73% 3.32% 6.85%	42.21% 10.90% 15.07%	25.32% 18.48% 14.61%	8.44% 42.18% 31.51%	1.30% 25.12% 31.96%											
Housing V₆	Not obvious (%)	1.2-1.5 times (%)			1.5-2 times (%)			2-3 times (%)			3 times or more (%)					
(Asset Appreciation before and after Resettlement)	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3	T1 T2 T3				
	14.94% 10.90% 7.31%	57.79% 20.38% 18.72%	22.73% 34.60% 36.99%	3.25% 22.27% 22.83%	1.30% 11.85% 14.16%											

Note: 1. The membership degree $r_{ij}, i = 1, 2, \dots, 6; j = 1, 2, \dots, 5$ in the membership matrix R refers to the percentage of comments perceived by the migrants. 2. T1: generic skills; T2: agricultural skills only; T3: people without working ability

Data source: calculated by the authors using the survey data.

In order to analyse perceived levels of shared benefits, we calculated a weight for each type of shared benefit. There are several ways for how to set weights. For example, each type of shared benefits can be treated as being equal, or researchers score each benefit, or experts are invited to provide scores or rank benefits. However, these ways of setting weights are often considered to be arbitrary and experts' views may not necessarily represent the views of affected people. A weighted fuzzy matrix is an alternative which is considered to be less arbitrary (Li, et al. 2015). When generating a weighted fuzzy matrix, the **Zadeh Judgement scale** is used to calculate weights. Table 3 shows the rules for performing the calculation. The principle behind the weighted fuzzy matrix is to compare the importance of two types of benefits and produce a score. For example, if a farmer considers A to be significantly more important than B, a score of 7 will be allocated in the box at the crossing of row point A and column point B in the matrix table.

Table 3 Zadeh Judgement scale for comparing two elements

Scale	Meaning
1	The importance is the same.
3	The former is slightly more important than the latter.
5	The former is obviously more important than the latter.
7	The former is significantly more important than the latter.
9	The former is a lot more important than the latter.
2,4,6,8	The intermediate scale of two adjacent scales above
Reciprocal	The latter is more important than the former.

Preference sets were determined as an expression of the needs of those resettled, based on the following assumptions.

- Most of those that were resettled prefer to lead an active life which includes having a job and earning a salary (Jiang, et al. 2018). Services and infrastructures that can help them to enter into such jobs.
- If a person only has agriculture skills, they may need to update their skills to be employable in urban environments (Wang 2012).
- Intuitively, when people do not have any ability to work, in particular the elderly, people with disability or children, skills training is likely to be less important. For them, facilities and services enhancing their quality of life would be important.

Based on these three assumptions, a weight coefficient matrix was calculated (see Table 4). As a result, a standardised weight coefficient set $W_0^i = \{W_0^1, W_0^2, \dots, W_0^6\}$ was obtained with the square root methods. The results were normalised.

Table 4 Pairwise Comparison for Those with Generic Skills

	V ₁	V ₂	V ₃	V ₄	V ₅	V ₆	W ₀ ⁱ
V ₁	1	7	3	2	4	5	0.383
V ₂	1/7	1	1/5	1/6	1/3	1/2	0.038
V ₃	1/3	5	1	1/2	2	3	0.163
V ₄	1/2	6	2	1	3	4	0.254
V ₅	1/4	3	1/2	1/3	1	2	0.099
V ₆	1/5	2	1/3	1/4	1/2	1	0.063

Note: 1. V₁=Employment Opportunities, V₂= Skills Training, V₃= Public Service, V₄= Public Infrastructure, V₅= Cash Compensation, V₆= Housing.

2. W₀ⁱ is the standardised weight coefficient of V_i.

In this table, the higher the value in W₀ⁱ column, the more important the V_i is.

Table 4 shows that the coefficient of employment opportunities is the highest, at 0.383, followed by public infrastructure and public service. Similarly, the Pairwise Comparison matrix of the weights for those resettled with agricultural skills only are shown in Table 5. Here, the maximum coefficient is skills training.

Table 5 Pairwise Comparison for Those with Agricultural Skills Only

	V ₁	V ₂	V ₃	V ₄	V ₅	V ₆	W ₀ ⁱ
V ₁	1	1/7	1/3	1/3	1/3	1/3	0.042
V ₂	7	1	5	6	5	4	0.485
V ₃	3	1/5	1	2	1/3	1/3	0.086
V ₄	3	1/6	1/2	1	1/2	1/3	0.071
V ₅	3	1/5	3	2	1	2	0.168
V ₆	3	1/4	3	3	1/2	1	0.148

The pairwise comparison matrix of those unable to work is shown in Table 6. The W₀ⁱ values indicate that people consider the improvement of public services and public infrastructures to be most important.

Table 6 Pairwise Comparison for Those Who are Unable to Work

	V ₁	V ₂	V ₃	V ₄	V ₅	V ₆	W ₀ ⁱ
V ₁	1	1/2	1/9	1/7	1/7	1/6	0.027
V ₂	2	1	1/7	1/6	1/5	1/4	0.041
V ₃	9	7	1	2	3	4	0.376
V ₄	7	6	1/2	1	5	4	0.304
V ₅	7	5	1/3	1/5	1	2	0.143
V ₆	6	4	1/4	1/4	1/2	1	0.106

To decide whether the three matrices are consistent in expressing preferences, a consistency test was conducted with λ_{max} , Consistency Index (CI) and Consistency Ratio

(CR). These are shown in Table 7 ($CI = \frac{\lambda_{max}-1}{I-1}$, $CR = \frac{CI}{RI(1,I)}$, $I = 6$). Results indicate that all three matrices have an $CR < 0.1$, meaning that they are all valid, therefore passing the consistency test. The coefficients of the perceived levels of shared benefits are shown in Table 7.

Table 7 Consistency Test of Matrix of Three Groups of Migrants

Type	λ_{max}	CI	CR
Generic skilled	6.1018	0.0204	0.0162
Agricultural-only skilled	6.4143	0.0829	0.0658
No working ability	6.4230	0.0846	0.0671

Data source: calculated by the authors.

The next step was to develop fuzzy appraisal matrices of all indicators for the three types of migrants. Matrix $R_{generic}$ is for those that have generic skills.

$$R_{generic} = (r_{ij})_{generic} = \begin{pmatrix} 0.03 & 0.08 & 0.37 & 0.43 & 0.09 \\ 0.64 & 0.32 & 0.03 & 0.00 & 0.00 \\ 0.00 & 0.00 & 0.15 & 0.28 & 0.57 \\ 0.00 & 0.00 & 0.10 & 0.25 & 0.66 \\ 0.23 & 0.42 & 0.25 & 0.08 & 0.01 \\ 0.15 & 0.58 & 0.23 & 0.03 & 0.01 \end{pmatrix}$$

Combined with the appraisal grade set U , the evaluation of each indicator for those with generic skills is quantified as,

$$S_{generic}^i = R_{generic} \times U^T = (r_{ij})_{generic} \times U^T$$

$$= \begin{pmatrix} 0.03 & 0.08 & 0.37 & 0.43 & 0.09 \\ 0.64 & 0.32 & 0.03 & 0.00 & 0.00 \\ 0.00 & 0.00 & 0.15 & 0.28 & 0.57 \\ 0.00 & 0.00 & 0.10 & 0.25 & 0.66 \\ 0.23 & 0.42 & 0.25 & 0.08 & 0.01 \\ 0.15 & 0.58 & 0.23 & 0.03 & 0.01 \end{pmatrix} \times \begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{pmatrix} = \begin{pmatrix} 3.47 \\ 1.39 \\ 4.42 \\ 4.56 \\ 2.23 \\ 2.18 \end{pmatrix}$$

Similarly, the quantified evaluation of each indicator of the other two types of migrants can be obtained as $S_{agriculture-only}^i = (1.80 \ 1.43 \ 3.30 \ 3.25 \ 3.75 \ 3.04)^T$, $S_{no\ working\ ability}^i = (2.12 \ 1.14 \ 4.04 \ 3.43 \ 3.67 \ 3.18)^T$. Table 8 shows the fuzzy comprehensive evaluation results of people with different pre-displacement skill sets.

Table 8 Coefficients of the shared benefits experienced or perceived by the migrants

Type	W_0^1	W_0^2	W_0^3	W_0^4	W_0^5	W_0^6
Generic skilled	0.489	0.052	0.044	0.124	0.206	0.084
Agricultural-only skilled	0.042	0.485	0.086	0.071	0.168	0.148
No working ability	0.027	0.041	0.376	0.304	0.143	0.106

Note: 1. V_1 =Employment Opportunities, V_2 = Skills Training, V_3 = Public Service, V_4 = Public Infrastructure, V_5 = Cash Compensation, V_6 = Housing.

2. W_0^i is the standardised weight coefficient of V_i .

Data source: calculated by the authors.

The coefficient of employment opportunities (W_0^1) for the group with generic skills was found to be significantly higher than that of other two groups. This means that they might have benefited from their skills being more transferrable to urban settings. Therefore, it was easier for them to receive reallocated jobs from local governments. This means they benefited more than the other two groups from the allocation of jobs. The coefficient of skills training (W_0^2) of those with agricultural skills only was significantly higher than those of the other two groups. This is logical as they needed to update their skills in order to be employable in urban environments. Finally, the group without working ability benefited most from public services and infrastructure. The coefficients of cash compensation and housing for all affected persons were between 0.080 and 0.210, which means that monetary compensation is an indispensable benefit for all migrants.

It is also important to look at the overall level of perceived shared benefits. The overall appraisal result can be represented by the following function:

$$B_{RM} = \sum_{i=1}^6 W_0^i \cdot S_{RM}^i + \varepsilon, i = 1, 2, \dots, 6$$

Where B_{RM} is the perceived benefit after the DIDR, S_{RM}^i is the fuzzy evaluation of V_i , W_0^i is the weight of S_{RM}^i , and ε is the perturbation term⁵.

⁵ It is assumed that the perturbation term is less affected by different groups, and the weight of the perturbation term need not be taken into account.

Table 9 The overall experienced and perceived shared benefits⁶

Type	V ₁	V ₂	V ₃	V ₄	V ₅	V ₆	Perceived level of shared benefits
Generic skilled	1.33	0.05	0.72	1.16	0.22	0.14	3.62
Agricultural-only skilled	0.08	0.69	0.28	0.23	0.63	0.45	2.36
No working ability	0.06	0.05	1.52	1.04	0.53	0.34	3.53

Note: V₁=Employment Opportunities, V₂= Skills Training, V₃= Public Service, V₄= Public Infrastructure, V₅= Cash Compensation, V₆= Housing.

Data source: calculated by the authors.

Table 9 suggests that those with different types of skill sets have different perceptions on the shared benefits following rural to urban resettlement. The perceived level of shared benefits by the generically skilled group is the highest at 3.62. Next are those who are not able to work, with a perceived level of shared benefits at 3.53. Finally, agriculture-only skilled groups who were not able to find employment in non-agricultural industries after resettlement had a low level of perceived shared benefits, at only 2.36.

6 Discussion and conclusions

In this paper, the theory of sustainable livelihoods framework and human capital was used to establish differences in the level of perceived improvements of shared benefits by migrants from rural to urban areas receiving the same resettlement plan. The main aim was to explore whether pre-displacement skills' sets affected perceptions of shared benefits after DIDR, using a longitudinal survey of the Yangtze-Huai River Diversion Project.

Whilst all migrants received the same monetary compensation, intangible losses, such as losses of human and social capital were not assessed and compensated. In this context, the establishment of a long-term and stable benefit-sharing mechanism is important in order to support sustainable livelihoods of migrants.

⁶ Since the disturbance term does not affect the comparison of benefit sharing results, it is omitted in this table.

In this paper, a fuzzy comprehensive evaluation model was used to evaluate perceived benefits contributing to migrants' capital necessary for restarting and sustaining new livelihoods in new urban locations. We improved the model by replacing experts' appraisal grade with respondents' appraisal grade in the calculation of the membership degree. The model thus reflects the personal experience of migrants more than other models.

An important result of the analysis is that people want to become active participants in the societies and economies they relocate to. Therefore, they wish to be provided with opportunities to work. With job markets requiring skills, they want to get training in order to be able to start new jobs.

The findings also show that different people perceived the benefits differently even if they were treated the same. Those with generic skills gained better employment opportunities, found new jobs more easily and made better use of other capitals received. Those with only agriculture skills were unable to find jobs in non-agriculture industries in the short term because they did not possess other skills. Initially, they tended to live on compensation and other subsidies. This is in line with other research findings (DfID 1999; Wilmsen & Van Hulst 2017).

These findings have important policy implications. Existing policies tend to treat those affected by resettlement as one homogeneous group. However, governments should take skills' sets into account in order to help migrants in a tailor-made manner more effectively. Benefit sharing is not only monetary compensation. Rather, it is important to help those affected to improve their abilities, so that they are enabled to experience the benefits from projects. Skills training provided by local government can help particularly those who only know farming to develop generic skills, and their perceived level of shared benefits may increase as a result.

DIDR is an opportunity for development (McDonald et al. 2008; MacDonald 2009; Perera 2014). Migrants with agriculture skills only need to transit from unsustainable livelihoods to sustainable livelihood after rural to urban resettlement.

Finally, we need to stress that our findings refer only to the initial transitional period and that we are not able to comment on the whole migration cycle. The process of social adaptation

after the resettlement takes time and needs can vary over time. Therefore, it will be important to conduct studies into significantly longer periods of time. Benefit-sharing mechanisms need to take account of the changing needs of migrants over time.

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