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- Munich -
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"Contingent Valuation of a more sustainable oasis management in the Tarim Basin"

– Results from WP 5.1.4 –

- 1. Introduction: Environmental Valuation – why and how?**
- 2. Contingent valuation of a more sustainable oasis management in the Tarim Basin**
- 3. Empirical results**
- 4. Benefit Transfer**
- 5. Concluding remarks**

1.

Introduction:

Environmental valuation – why and how?

Why ?

Main application: The social appraisal of environmental projects

➔ Environmental valuation is a decision tool for a rational use of public funds

CBA of a more sustainable oasis management in the Tarim basin

▶ Comparison: **social benefits** ↔ **social costs**

- preservation of **endangered plant** and **animal species** in the lower reaches of the Tarim for future generations
- better **living conditions** for **future generations** since less groundwater will be extracted
- aesthetic values, improved **landscape beauty** (no dried up riverbeds, new wetlands)

no market prices available !

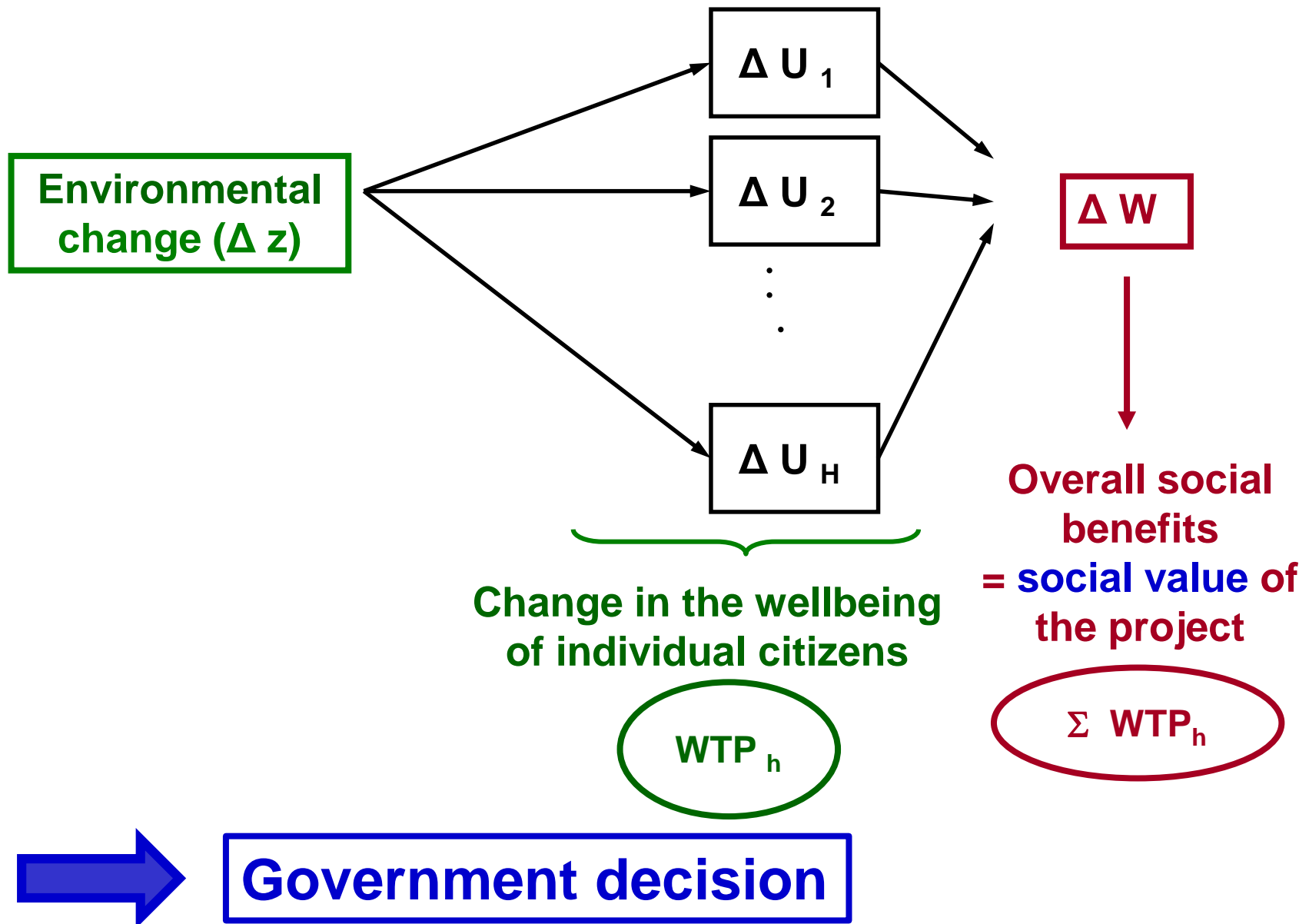
- capital cost
- wages
- materials
- opportunity cost, forgone profits
- etc.

market prices available !

Special assessment methods needed !

How ?

Structure of an environmental valuation study:



The practice of Contingent Valuation:

Objectives: Assessment of

- the **social value** of a public project: $\sum_h WTP_h^{true}$ of all H people affected directly or indirectly by that project ($h = 1, 2, \dots, H$)
- the **determinants** of **WTP** (e. g. household size, attitudes, life style, income etc.)

Practical procedure:

- **Personal interviews** with a **representative random sample** of all households affected by the project $\Rightarrow WTP_s^{stated}$ ($s = 1, 2, \dots, S$)
- Determination of the **average WTP** of all respondents in the sample:

$$\overline{WTP}^{sample} = \frac{\sum_{s=1}^S WTP_s^{stated}}{S}$$

- **Aggregate WTP:** $WTP^{soc} = H \cdot \overline{WTP}^{sample}$

Participation: Using "Citizen Expert Groups" (CEG) to improve the quality of the questionnaire and the validity of CVM results

Citizen

Expert

Groups

In a normal pretest interview only one respondent is confronted with the questionnaire to be tested. In a CEG the **group members can discuss with their peers**, so they feel encouraged to state doubts, questions etc. which they would not have mentioned if alone in a pretest

CEG members are no professional experts (e. g. for water management). They are employed as **"experts" for normal people's intellectual abilities, attitudes etc.**

Ideally, a **representative sample of citizens** is drawn from the group of all households potentially affected by the project to be valued





2.

**Contingent valuation of a more sustainable
oasis management in the Tarim Basin**

Use values and nonuse values of a more sustainable water management in the middle reaches of the Tarim:

Total value = **use value**



- *less frequently* occurring periods of **water shortage** for the people living in the lower reaches of the Tarim
- *increase* of **agricultural production**
- *protection* of **roads** and **settlements against sandstorms** through new poplar forests
- possibility of building **new settlements** in this area
- aesthetic values, improved **landscape beauty** (no dried up riverbeds, new wetlands)
- better possibilities for **tourism** in the lower reaches of the Tarim

➔ Tarim region

+ **non-use value**

(*existence value, bequest value, option value*)



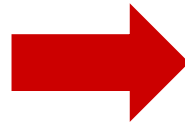
- tackling the **desertification problem** in China as a **national task**
- preservation of **endangered plant** and **animal species** in the lower reaches of the Tarim for future generations
- better **living conditions** for **future generations** since less groundwater will be extracted
- doing something for **minorities** in China
- ...

➔ whole China



Benefit transfer as a method for the approximation of the total social value of the SUMARIO scenario:

Conducting a **CVM survey** for the appraisal of the long distance nonuse value of the SUMARIO scenario in **Beijing** as an example of a Chinese megacity



Transferring the **results** from the Beijing study **to other comparable megacities** in order to assess the **total social value** of the SUMARIO scenario

- ⇒ **No new CVM surveys** have to be conducted in the other cities!
- ⇒ **Cost-saving!**

Empirical goals:

- Assessing the **willingness to pay** of **people living in the Tarim basin** for a more sustainable oasis management
- Assessing **Beijing residents' willingness to pay** for a more sustainable oasis management in the Tarim Basin
- **Benefit transfer** study in order to assess also the WTP of people living in other Chinese megacities

Methodological goals (field experiments):

- Testing the influence of the **elicitation question format** on stated WTP (dichotomous choice vs. trichotomous choice)
- Testing the **influence of gifts** to respondents on stated WTP (reciprocity)
- Testing for **different kinds of altruism** (true altruism, paternalistic altruism, impure altruism - "warm glow of giving")
- Socially desirable responding - **SDR**
- Influence of **character traits** on stated WTP ("**Big Five**")

General structure of our CVM interview:

(1) **Demographic and Warm-up questions** w.r.t. general information, previous knowledge about the project etc.

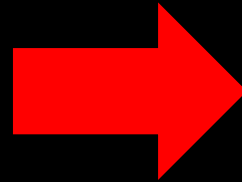


(2) Detailed description of the natural good or the project to be valued ("**project scenario**")

The project scenario:

"Scientists have developed a program with the overarching goal to **improve** the **living conditions** in the area along the Tarim River for man and nature. This program is called the **Tarim Environmental Preservation Plan** and implies a **science-based water management** that ensures that more and more water arrives in the lower reaches of the Tarim River, so that the **riparian forests and grasslands can recover** there. Once the river and its natural environment will have fully recovered, the area will be **less exposed** to **sandstorms** and **dust**; typical animals and plants will survive; also, the **living conditions** of **future generations** will **improve**."

The scenario in short:



General structure of our CVM interview:

(1) **Demographic and Warm-up questions** w.r.t. general information, previous knowledge about the project etc.



(2) Detailed description of the natural good or the project to be valued ("**project scenario**")



(3) Explanation of the market mechanism / payment vehicle ("**payment scenario**")

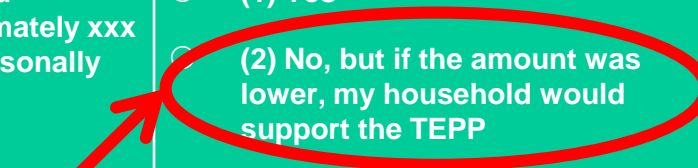
The payment scenario:

"In order to get the Tarim Environmental Preservation Plan financed, Central Government needs to transfer more money to the Tarim area. In order to finance these transfer payments **government** would have to **increase taxes** if TEPP was realized.

This would lead to rising monthly expenditures for households. Economists estimate that the proposed program would **increase** an **average Beijing household's monthly expenditures** by approximately **10 RMB** (*alternatively: 25 RMB / 50 RMB / 100 RMB / 150 RMB / 200 RMB*)."

	<p>Considering that your monthly household expenditures would increase by approximately xxx RMB through the program would you personally be willing to support it?</p>	<p><input type="radio"/> (1) Yes</p> <p><input checked="" type="radio"/> (2) No, but if the amount was lower, my household would support the TEPP</p> <p><input type="radio"/> (3) No, my household does not tolerate any increase of its monthly expenditures in order to get the TEPP realized</p>
<p>If (2)</p>	<p>Thus, which increase of additional monthly expenditures would you accept in order to get the program realized?</p>	<p>____ RMB per month</p>

Trichotomous choice elicitation question format



General structure of our CVM interview:

(1) **Demographic and Warm-up questions** w.r.t. general information, previous knowledge about the project etc.



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(4) **Elicitation question** (WTP)



(5) **Debriefing and follow-up questions** w.r.t. income, marital status, children, attitudes towards environmental issues, government responsibilities etc.

3.

Empirical results

The SUMARIO CVM survey in Beijing

- **2 438** completed (face-to-face) **interviews in Beijing**
- Street **intercept** interviews
- **1246 interviews** with a money gift of **20 RMB or 40 RMB** as an **incentive** to participate in the survey, **1192 interviews** with **no gift** at all
- **Quota sampling** to ensure a certain representatives of the sample: age, income, level of education

Overall size of overall subsample	N = 2,472
Valid questionnaires	N=2,438

Socio-demographic characteristics:

	N	Mean	Std. dev.	Minimum	Maximum
Age	2438	40.209	15.417	18	84
Male	2437	0.504	0.500	0	1
Children	2391	0.345	0.475	0	1
Education	2437	4.320	1.343	1	7
Income (1000 RMB)	2409	8.485	7.747	1	50

Assessment of WTP of the different subsamples

The two surveys in comparison:

	Xinjiang survey	Beijing survey
Number of respondents	61	2438
Survey mode	Interviews during workshops (the questionnaire was read out loud and filled in by the participants)	Quota-based intercept survey (the questionnaire was read out loud and filled in by the interviewers)
WTP elicitation format	Payment Card	Referendum format
Mean WTP	57 RMB	108 RMB
Most important ESS (Top 3)	(1) Protection from sandstorms and dust, (2) habitat for plant and animal species, (3) soil stabilization	(1) Protection from sandstorms and dust, (2) soil stabilization , (3) habitat for plant and animal species
Characteristics of the respondents <ul style="list-style-type: none"> - Gender - Age - Education - Household income 	Mean values <ul style="list-style-type: none"> - 56% men - 40 years - 74% with higher education - 4721 RMB per month 	Mean value <ul style="list-style-type: none"> - 50% men - 40 years - 38% with higher education - 8485 RMB per month

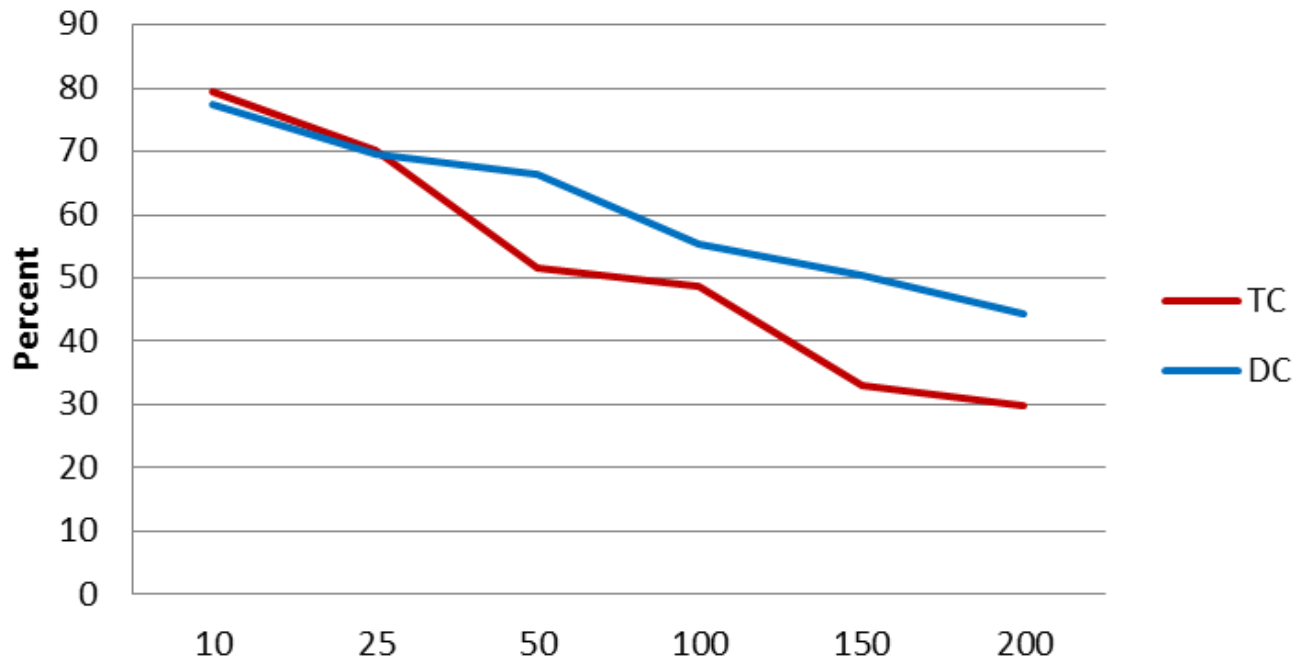
	N	10 RMB	25 RMB	50 RMB	100 RMB	150 RMB	200 RMB	Mean WTP	
		Proportion of 'yes' (%)						RMB	% of income*
Total	2431	79	70	55	50	37	33	107	1.3
Base split	94	79	69	51	39	30	32	89	0.9
Gift 20 RMB	47	81	65	44	48	35	27	89	1.1
Gift 40 RMB	96	79	76	61	59	34	31	114	1.4
Yes/No	94	79	70	55	50	37	33	154	1.8

*Mean income of the corresponding split sample

Considering that your monthly household expenditures would increase by approximately xxx RMB through the program would you personally be willing to support it?

- (1) Yes
- (2) No, but if the amount was lower, my household would support the TEPP
- (3) No, my household does not tolerate any increase of its monthly expenditures in order to get the TEPP realized

TC vs. DC (% of 'yes')



Considering that your monthly household expenditures would increase by approximately xxx RMB through the program would you personally be willing to support it?

- | | TC (N=1837) | DC (N=594) |
|-----------------------|--|--------------------------------------|
| <input type="radio"/> | (1) Yes | <input type="radio"/> (1) Yes |
| <input type="radio"/> | (2) No, but if the amount was lower, my household would support the TEPP | <input type="radio"/> (2) No |
| <input type="radio"/> | (3) No, my household does not tolerate any increase of its monthly expenditures in order to get the TEPP realized | |

*** = 1%
 ** = 5%
 * = 10%

	Model 1	Model 2	Model 3
	Coefficient	Coefficient	Coefficient
CONSTANT	0.011	-0.003	1.352***
BID	-0.006***	-0.006***	-0.007***
T1 (20 RMB)	0.031	0.021	0.002
T2 (40 RMB)	0.235***	0.226***	0.172**
T3 (Yes/No)	0.379***	0.376***	0.382***
MALE	0.122**	0.109*	0.112*
AGE	0.003	0.003	0.003
EDUCATION	0.062***	0.058**	0.053**
HAN	0.117	0.132	0.127
MARRIED	-0.200***	-0.198***	-0.124*
KIDS	0.088	0.092	0.126*
BEIJINGER	-0.089	-0.096	-0.060
INCOME	0.008**	0.007*	0.008**
SUPPORT_EP		0.285***	0.176**
NONUSE			0.506***
PROTEST			-0.405***
Observations	N=2160	N=2160	N=2160
Log likelihood	-1346	-1341	-1256
Pseudo R2	0.095	0.101	0.158

<p>Which WTP elicitation format is most suitable for CVM surveys conducted in China?</p>	<p>Field experiments to test the following elicitation formats: (1) payment card, (2) dichotomous choice and (3) trichotomous choice</p>	<p>Trichotomous choice outperforms the remaining formats (prompt replies, reduction of “polite” yes-replies, plausible result)</p>
<p>Are gifts of money suitable incentives for CVM surveys conducted in China?</p>	<p>Field experiments to test gifts of money of (1) little value (20 RMB) and (2) higher value (40 RMB)</p>	<p>Positive effect on willingness to participate in both splits Fewer break-offs in the 20 RMB split Biasing effect on WTP in the 40 RMB split</p>
<p>How can altruistic preferences be reliably measured and how do different types of altruism relate to WTP?</p>	<p>Donation experiment to measure (1) egotistic preferences, (2) the warm-glow of giving and (3) “pure” altruistic preferences</p>	<p>WTP of</p> <ul style="list-style-type: none"> - egoists: 77 RMB - impure altruists: 130 RMB - pure altruists: 118 RMB
<p>Does social desirable responding distort WTP?</p>	<p>Measurement of social desirable responding by means of an established inventory (vgl. Börger, 2013, Paulhus, 1988)</p>	<p>Need-for-Social-Approval Score: 2,7 out of 8 points Significant, positive effect of social desirable responding on WTP</p>
<p>Do character facets matter for WTP?</p>	<p>Measurement of character facets by means of an established inventory (Soto and John, 2009)</p>	<p>Significant effects of Altruism (+) and Neuroticism (-) on WTP No effects of Order, Self-discipline, Compliance und Openness to new ideas</p>

Interpretation of the money gift:

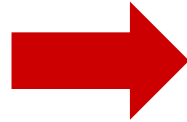
	Total %	20 RMB %	40 RMB %
Do you think it is appropriate that respondents in a survey receive some money in return for their effort?			
- (1) Yes	0.40	0.39	0.42
- (2) No	0.27	0.28	0.25
- (3) It does not matter	0.33	0.33	0.33
In your opinion, the amount of money we gave you is...			
- (1) too low			
- (2) too high	0.03	0.03	0.03
- (3) just ok	0.11	0.08	0.14
- (4) it doesn't matter	0.27	0.26	0.28
	0.59	0.64	0.54
In your opinion, most people will consider the money mainly as...			
- (1) a sign of appreciation of their participation in the interview	0.25	0.28	0.20
- (2) a payment for their time spent on the interview	0.26	0.26	0.25
- (3) an attempt to influence their vote in favour of the project	0.38	0.33	0.43*
- (4) Other	0.12	0.12	0.12

4.

Benefit transfer

Benefit transfer as a method for the approximation of the total social value of the SUMARIO scenario:

Conducting a **CVM survey** for the appraisal of the long distance nonuse value of the SUMARIO scenario in **Beijing** as an example of a Chinese megacity



Transferring the **results** from the Beijing study **to other comparable megacities** in order to assess the **total social value** of the SUMARIO scenario

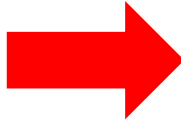
⇒ **No new CVM surveys** have to be conducted in the other cities!

⇒ **Cost-saving!**

Two variants of benefit transfer techniques:

(1) Benefit **value** transfer

Assumption: $WTP_P = WTP_S$ (average WTP is assumed to be the same at both sites)

Social values: $SV_B = N_B \cdot WTP_B$  $SV_S = N_S \cdot WTP_B$

Beijing Shanghai

(2) Benefit **function** transfer

$WTP_B = \beta_{B0} + \beta_{B1} (\text{income}_B) + \beta_{B2} (\text{age}_B)$  $SV_B = N_B \cdot WTP_B$

$WTP_S = \beta_{B0} + \beta_{B1} (\text{income}_S) + \beta_{B2} (\text{age}_S)$  $SV_S = N_S \cdot WTP_S$

AHLHEIM, M., FRÖR, O., LUO, J., PELZ, S., JIANG, T. (2015), Towards a Comprehensive Valuation of Water Management Projects When Data Availability Is Incomplete—The Use of Benefit Transfer Techniques, WATER, Vol. 7, 2472-2493.

Table 5. Willingness to pay in RMB of Beijing and Shanghai residents (benefit transfer).

Transfer Mode	Beijing (Study Site)		Shanghai (Policy Site)	
	Mean WTP (95% c.i.) ¹	Social Value	Mean WTP (95% c.i.)	Social Value
Value transfer	107 (98; 116)	431 Mio.	107 (98; 116)	746 Mio.
Function transfer (theory-driven model)	107 (98; 116)	429 Mio.	111 (101; 120)	774 Mio.

Table 6. Approximation of the overall social value.

City Characteristics and Welfare Measures	Beijing	Shanghai	Guangzhou ¹	Tianjin ²	Shenzhen ³	Total
Monthly disposable household income (in 1000 RMB)	8.485	10.512	9.513	8.164	11.101	--
Monthly WTP per household (in RMB)	107	111	109	108	112	--
Number of households	4.006 Mio.	6.969 Mio.	4.280 Mio.	3.841 Mio.	2.872 Mio.	21.968
Social value (in RMB)	429 Mio.	774 Mio.	467 Mio.	415 Mio.	322 Mio.	2407 Mio.

Notes: ¹ Values approximated based on [39]; ² Values approximated based on [40]; ³ Values reported in [41].

5.

Concluding remarks

- The **Contingent Valuation Method** for the economic assessment of environmental projects is a **powerful tool of government decision making**. It helps government to **allocate public funds in a rational way**.
- It addresses **efficiency** as well as **social justice** aspects of environmental projects.
- When assessing environmental projects it is recommended to check if there are also **nonuse values** accruing from that project.
- If yes, one should conduct CVM surveys **not only at the project site** but also at some other "typical" sites and then use **benefit transfer** to extrapolate the results from the study sites to similar other sites in order to assess the true total value of that project.
- We recommend the **trichotomous choice** elicitation question format
- **Small money gifts** trigger people's **willingness to participate** in the survey **without influencing stated WTP**
- **Altruism** has a **positive effect on WTP**.
- **SDR** also has a **positive effect** on **stated WTP**, but we **doubt** if this represents true WTP.



Thank you very much for your attention!