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Future Megacities
Megastädte von morgen

RECAST Urumqi

Meeting the Resource Efficiency Challenge in a Climate Sensitive Dryland Megacity Environment – Urumqi as a Model City for Central Asia

Dr. Thomas Sterr
(Project Coordinator)
Department of Geography, Heidelberg University

Bernd Franke
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ifeu – Institute for Energy and Environmental Research HD

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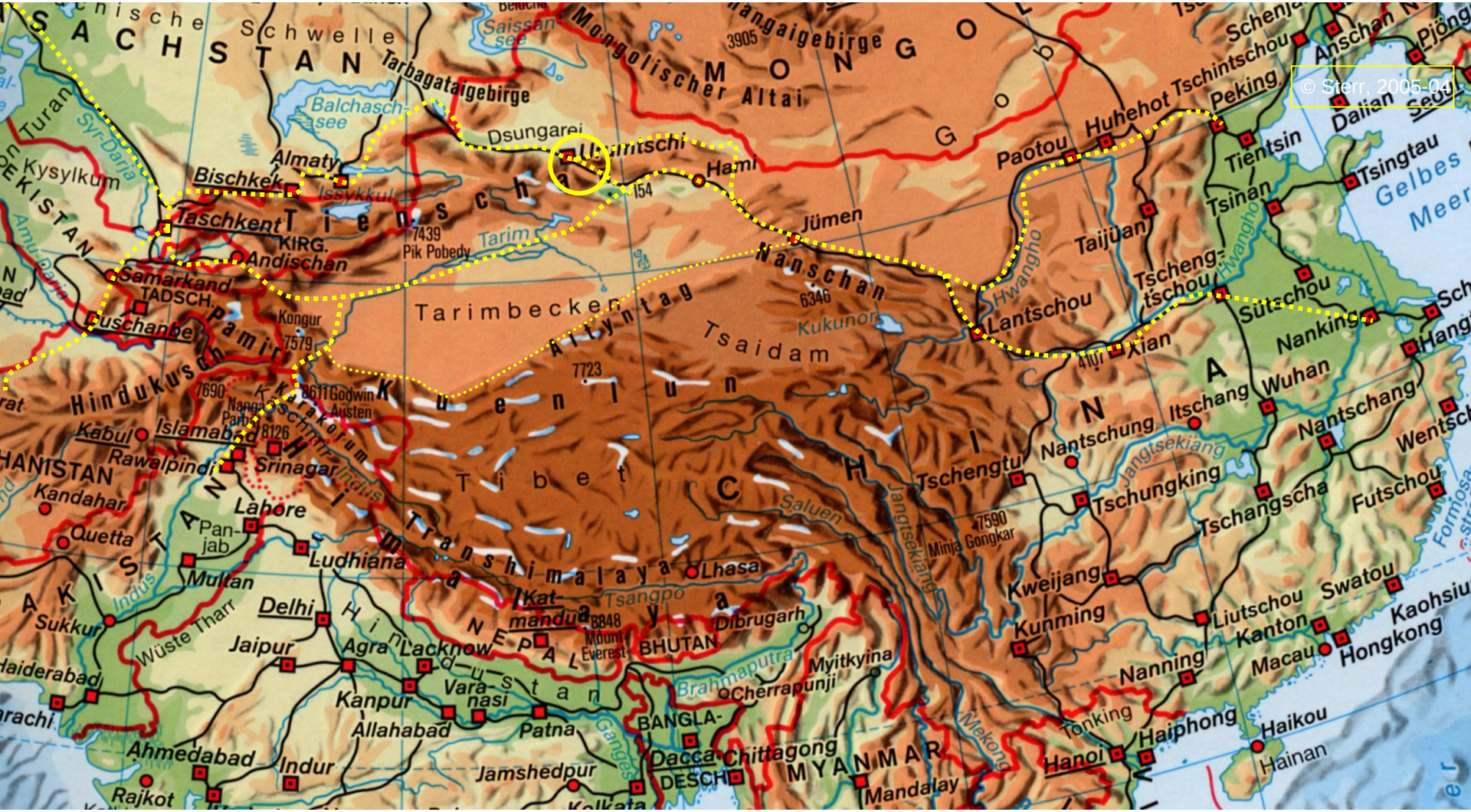
ZHB

International BMBF-Conference
„Future Megacities in Action“
13th – 16th of May 2013

RECAST URUMQI
中 国 · 乌 鲁 木 齐

Urumqi - Central City of Central Asia



RECAST Urumqi – Leading Participating Actors in Uchang and the Rhine-Neckar Region

ERKEN-TUNIYAZ, Vice governor of Xinjiang
(Xinjiang Uigur Autonomoius Region of the People's Republic of China) *project patron*

DULIHONG, Abuduerxun
Director Gen. Department of Environmental Protection (DEP) of Xinjiang Government
political head provincial level

LI, Hongbin
First Deputy Mayor of Urumqi City
political head city level

Dr. Thomas STERR
HD University
Dept. of Geography
chief coordinator

Prof Dr. ZHANG, Xiaolei
Director General DoST (Department of Science & Technology) Xinjiang Government
scientific director (chinese side)

ZHANG, Ming
Vice President XJAEPS
project officeUrumqi / transfer to practice

AHATI, Jiaerheng
President XJ Academy of Environmental Protection Sc. (XJAEPS)
Sino-German coord.

Ms. Sha XIA
IUWA / Doct.student HD Univ.
Sino-German coordination / chief translation

AHATI, Jiaerheng President XJAEPS	*Energy Efficiency*	***Bernd FRANKE*** Scientific Director, ifeu gGmbH
ZHANG, Xinyou Director General DEP Urumqi	*Material Resource Efficiency*	***Prof. Dr. D. Günter LIESEGANG*** Head IUWA e.V.
Prof. Dr. ZHANG, Jiebin CAS Xinjiang, Department of Geoecology	*Regional Water Modelling*	***Prof. Dr. Kurt ROTH*** Dir. Inst. f. Environmental Physics, HD Univ.
Prof. JIANG, Huifang Xinjiang Agricultural University	*Urban Water Use Efficiency*	***Prof. Dr. Olaf BUBENZER*** Prof. for Geoecology, HD Univ./Cologne Univ.

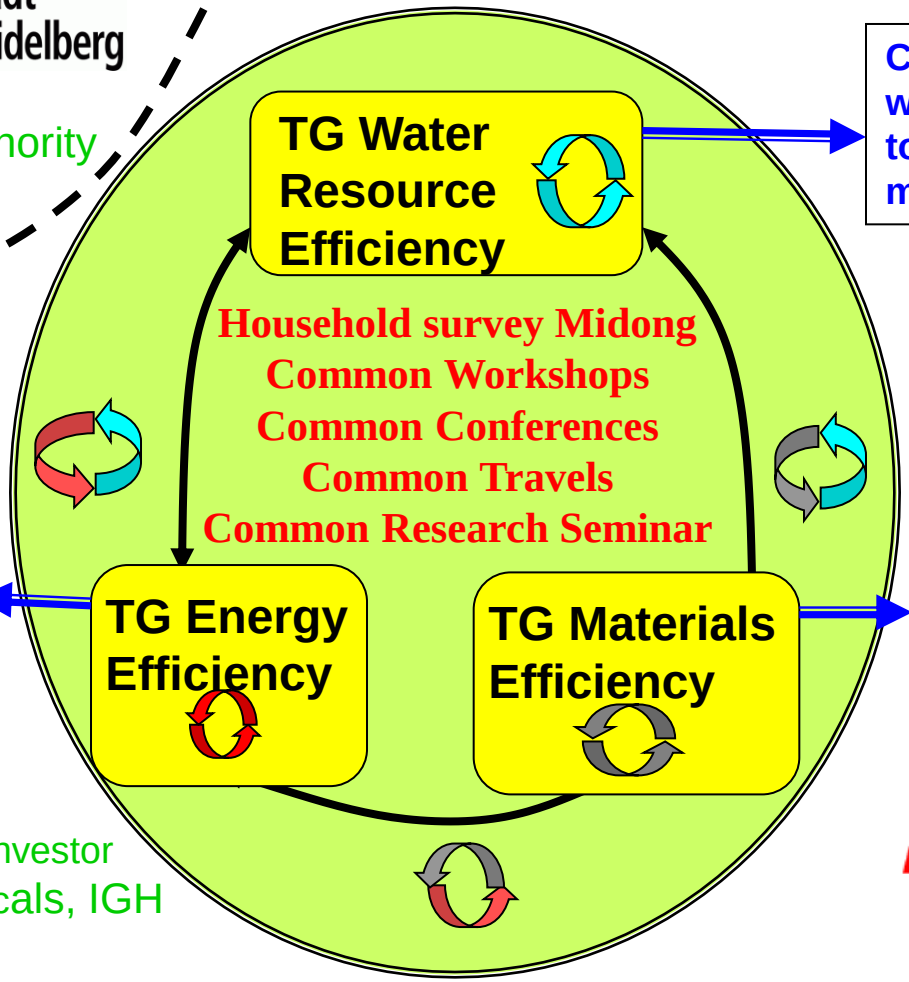
Sterr 02/2013

Challenges for Resource Efficiency within „RECAST Urumqi“

Metropolregion Rhein-Neckar
Umweltkompetenzzentrum.UKOM

Stadt Heidelberg

Regional Planning Authority
MRN, XJ Government
DOST, DEP



Catchment based regional water model as a planning tool; water information management for Urumqi

XJ Agricultual University
URC Water Bureau

Low energy housing in old and new buildings (Nanshan,Xinfubao)
LCA of ZhongTai school exchange

ifeu

CC Urumqi City, Private Investor
Investor, Zhongtai Chemicals, IGH

Waste management soft-ware development for industry; circular econo-my and EIP development in Midong

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Water Resource Efficiency

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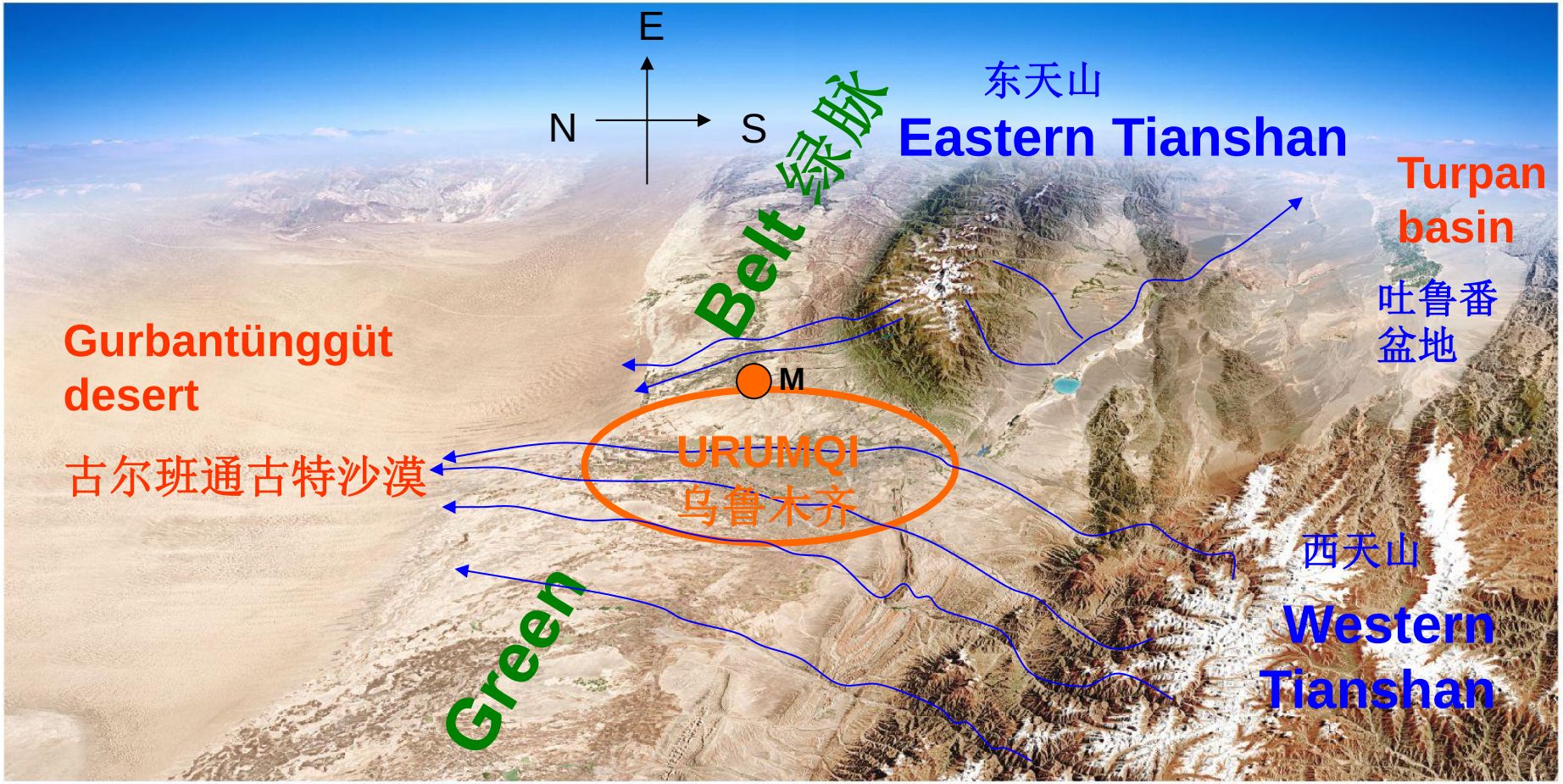
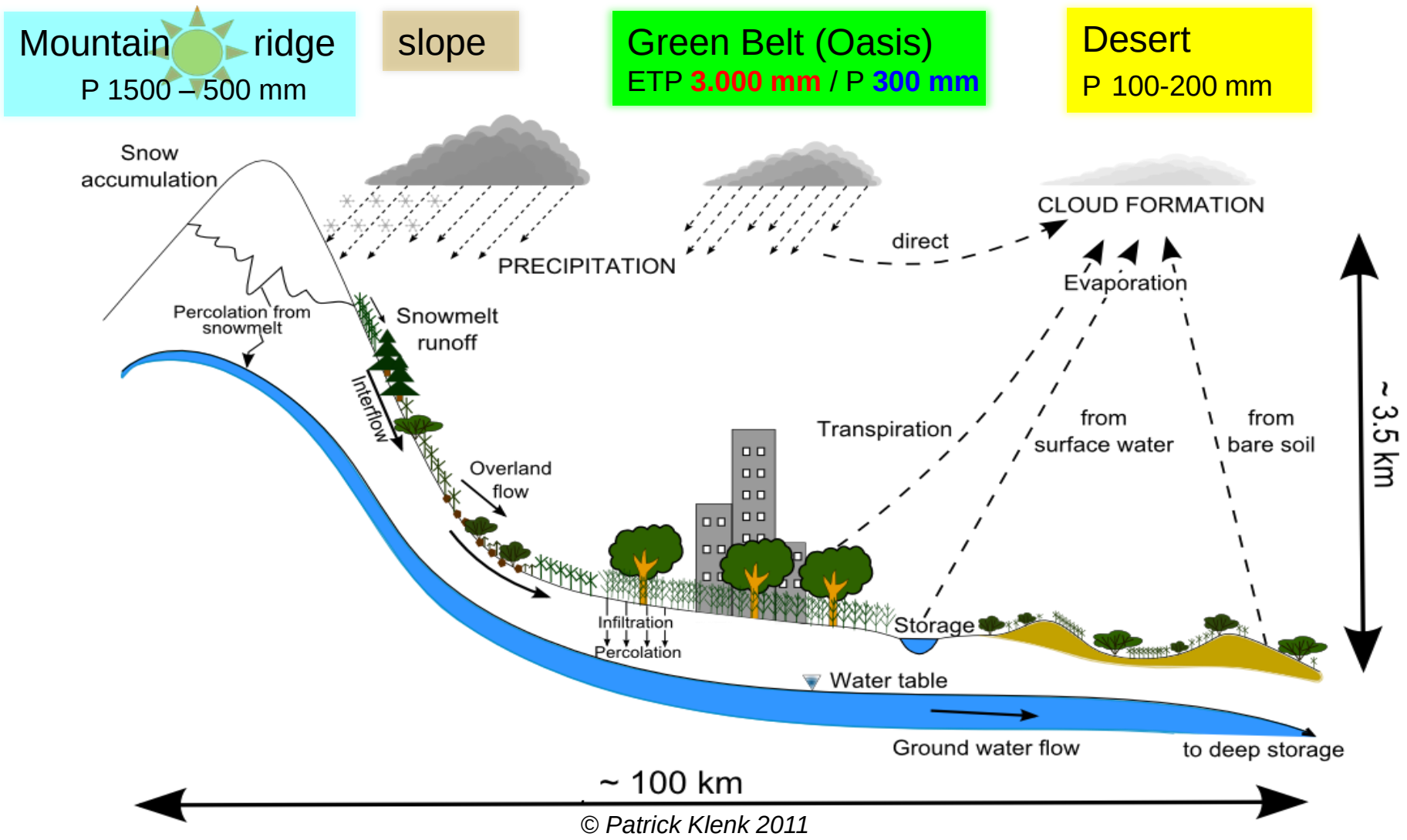
Highly sensivite environment and vulnerability of Urumqi / Uchang
乌鲁木齐市/乌昌地区的高度明感环境和弱点



Catchment Based Water Modelling for Urumqi

乌鲁木齐基于流域的水资源模拟



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GPR Based Soil Water Content Measurements in URC Region as a Proxy for its Hydrological State & Intertemporal Changes

.

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Highly sensivite environment and vulnerability of Urumqi / Uchang
乌鲁木齐市/乌昌地区的高度明感环境和弱点

Urumqi in 1949
(88.000 inhabitants)

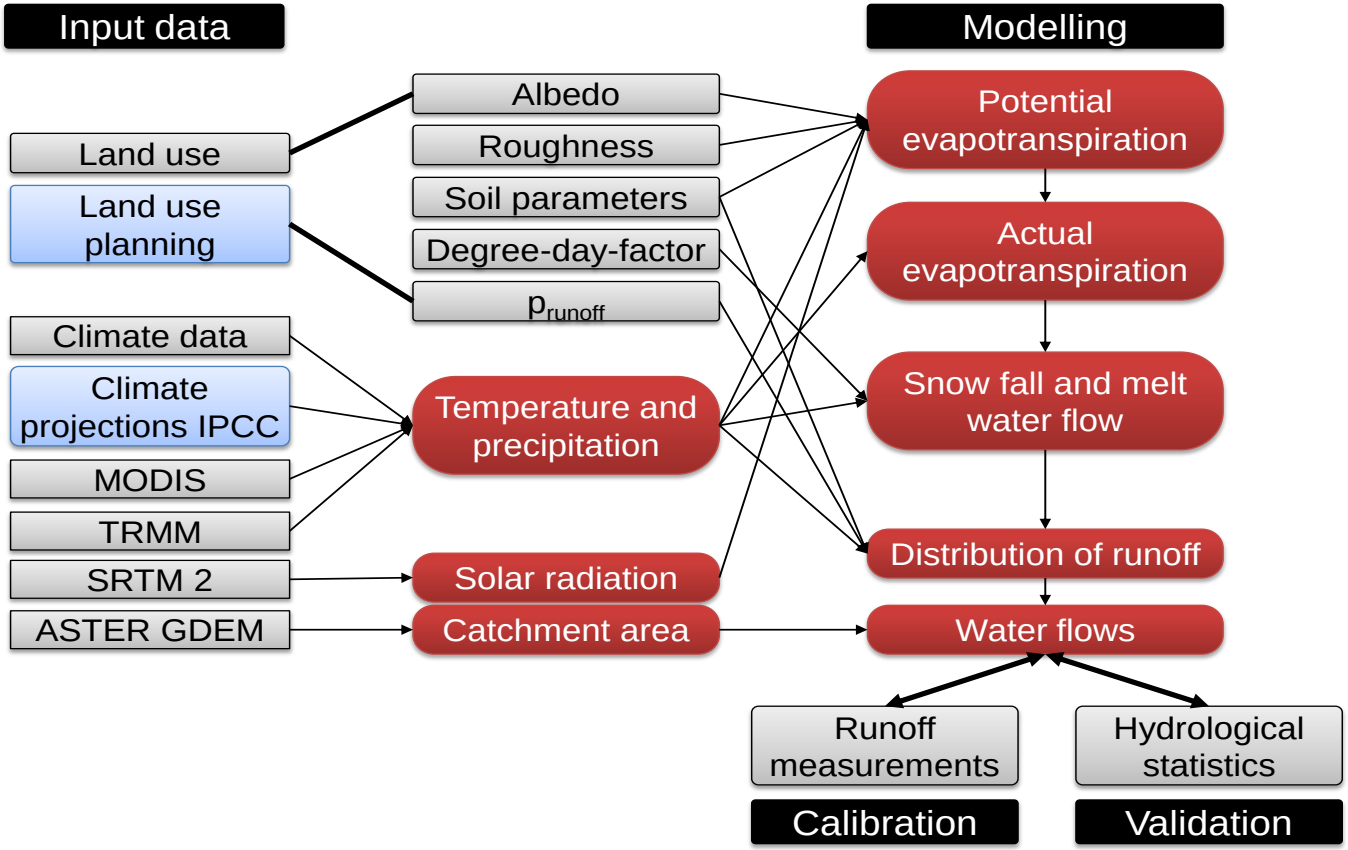
Source: pictures taken in museum
at Grand Bazaar, Urumqi

Urumqi
in the year 2000
(see 2nd picture)
(1,87 Mio inhabitants)

Urumqi 2011
3,1 Mio inhabitants)
(Uchang: 4,5 Mio)

Catchment Based Water Modelling for Urumqi

乌鲁木齐基于流域的水资源模拟



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Catchment Based Water Modelling for Urumqi
乌鲁木齐基于流域的水资源模拟

Recent vs. Projected water demand

Year	Total water resources (m^3)	Total projected water demand (m^3)
2004	1,066,000,000	
2005	1,051,870,000	
2007	1,184,770,000	
2010		1,043,799,741
2020		1,205,496,601
2030		1,283,163,614
2040		1,329,880,879
2050		1,319,564,526

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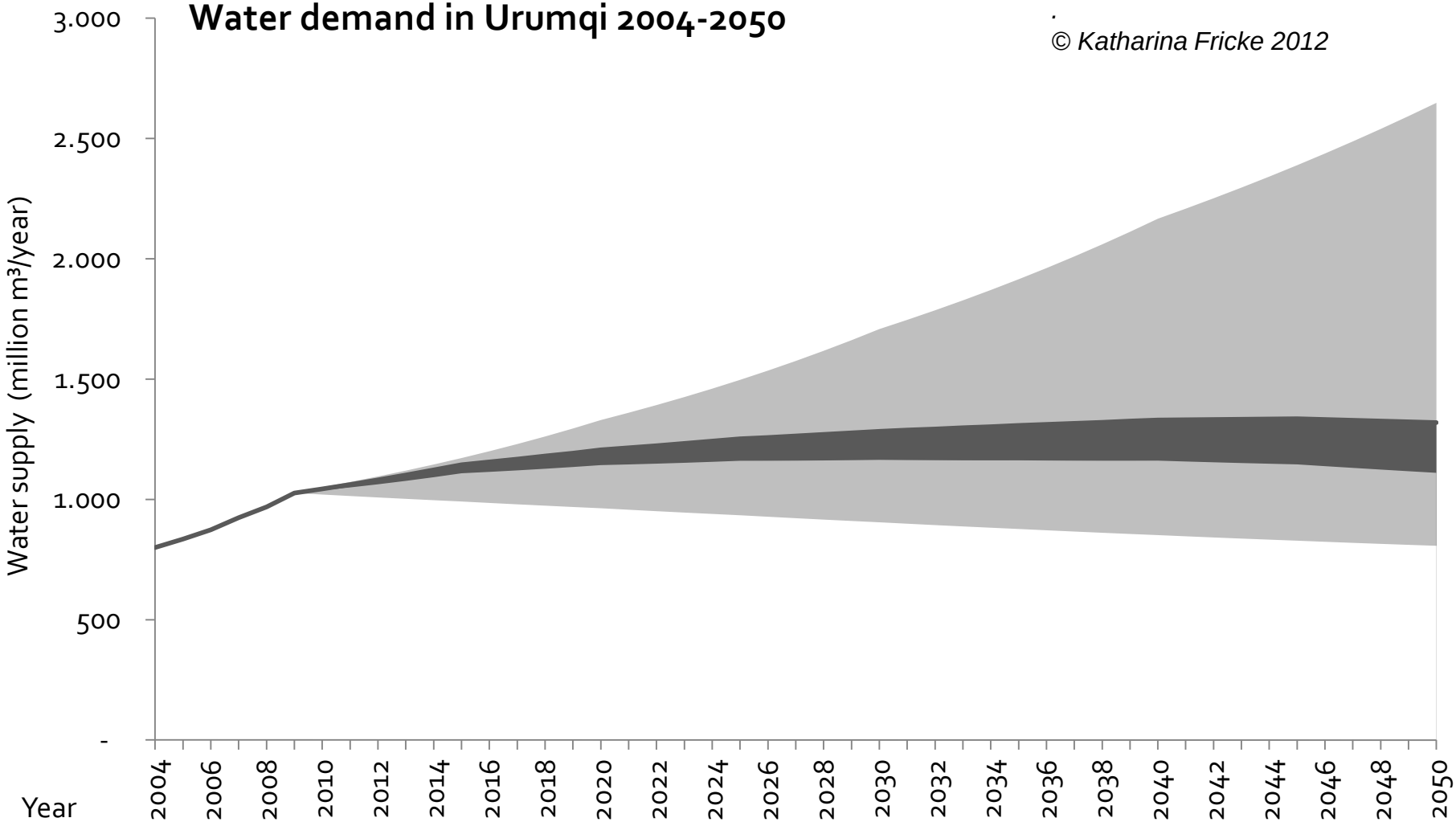
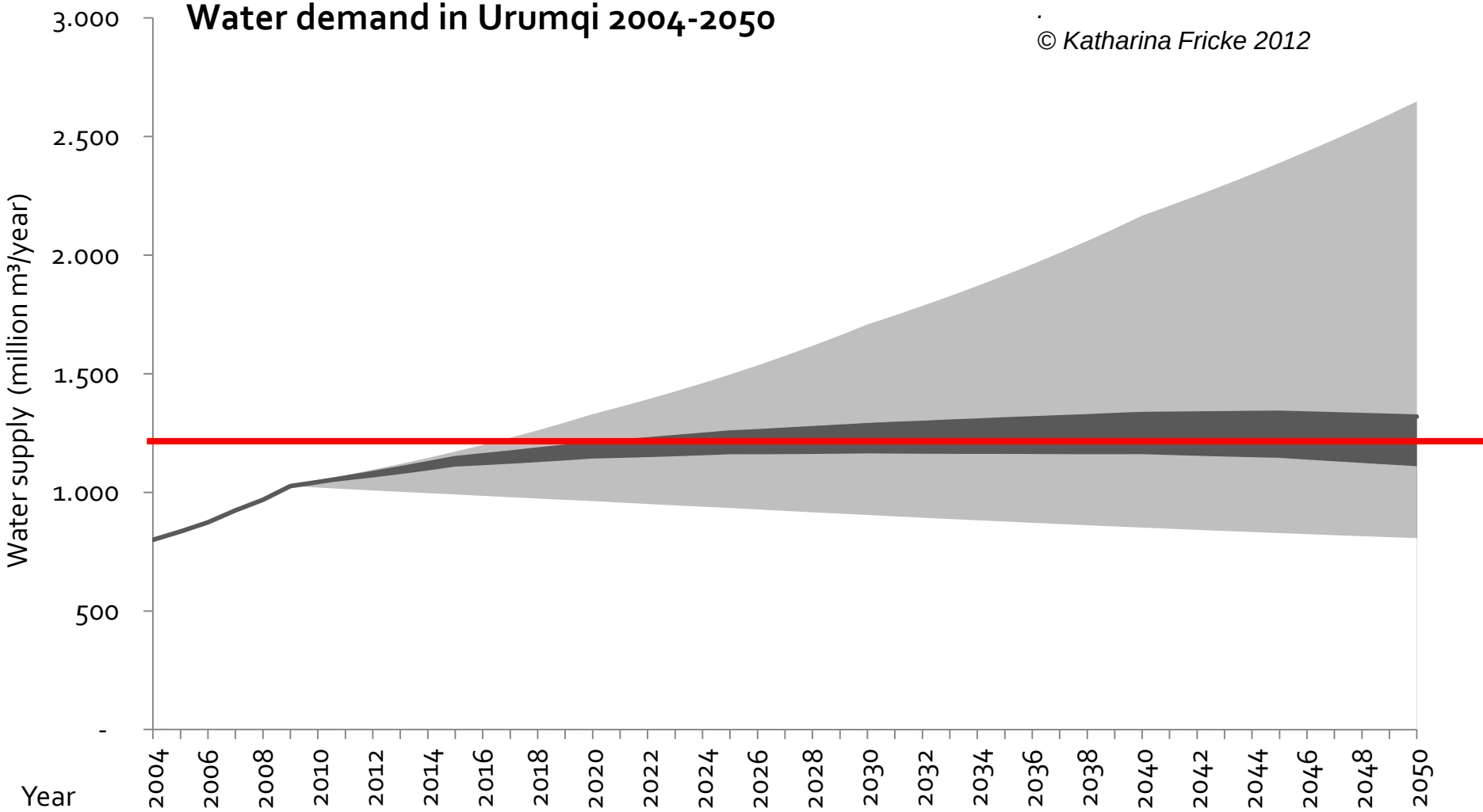
Catchment Based Water Modelling for Urumqi

乌鲁木齐基于流域的水资源模拟



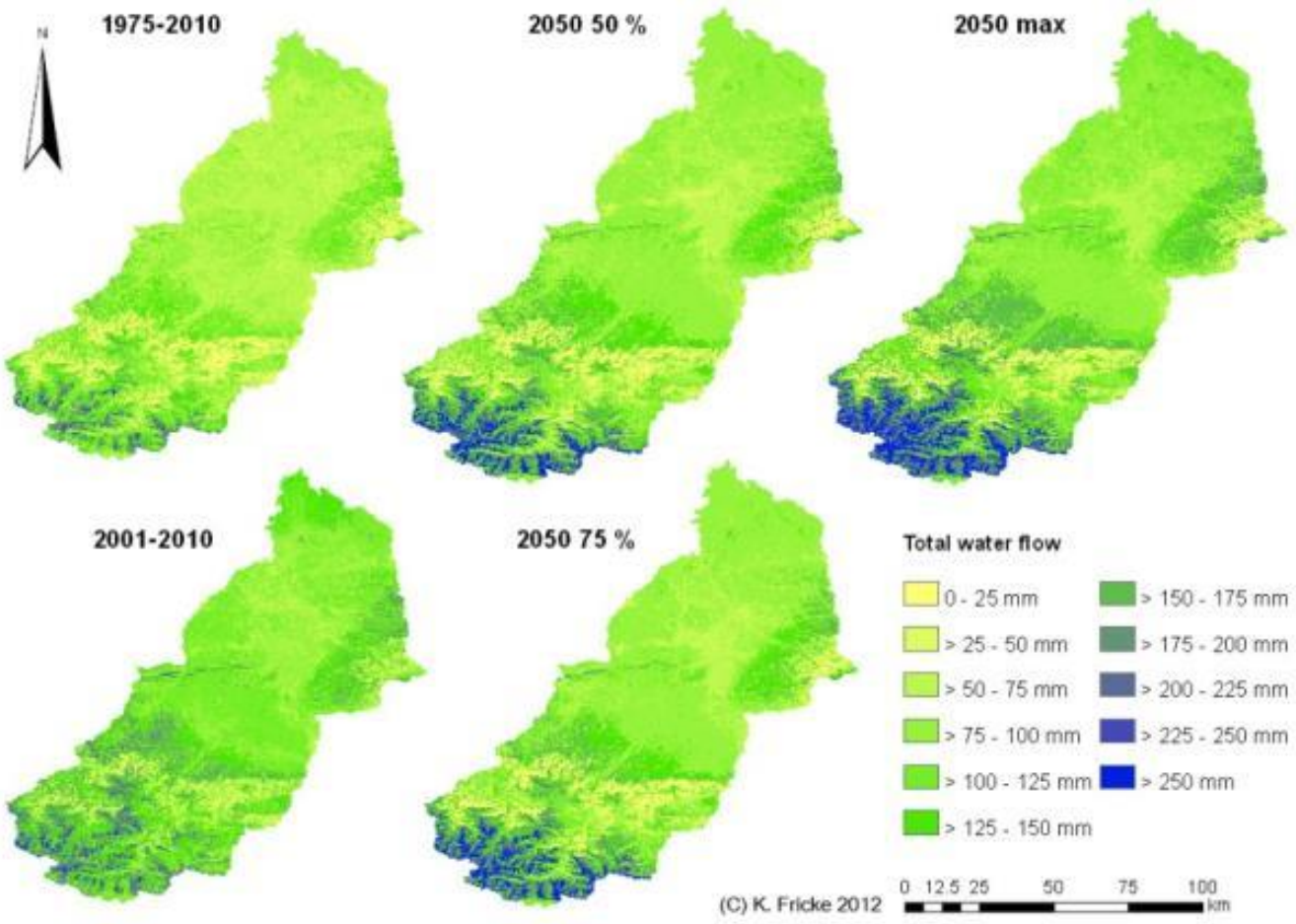
Catchment Based Water Modelling for Urumqi

乌鲁木齐基于流域的水资源模拟



Water flow within the catchment area of Urumqi city - simulations for different climate data sets

乌鲁木齐流域水流——基于不同数据的模拟



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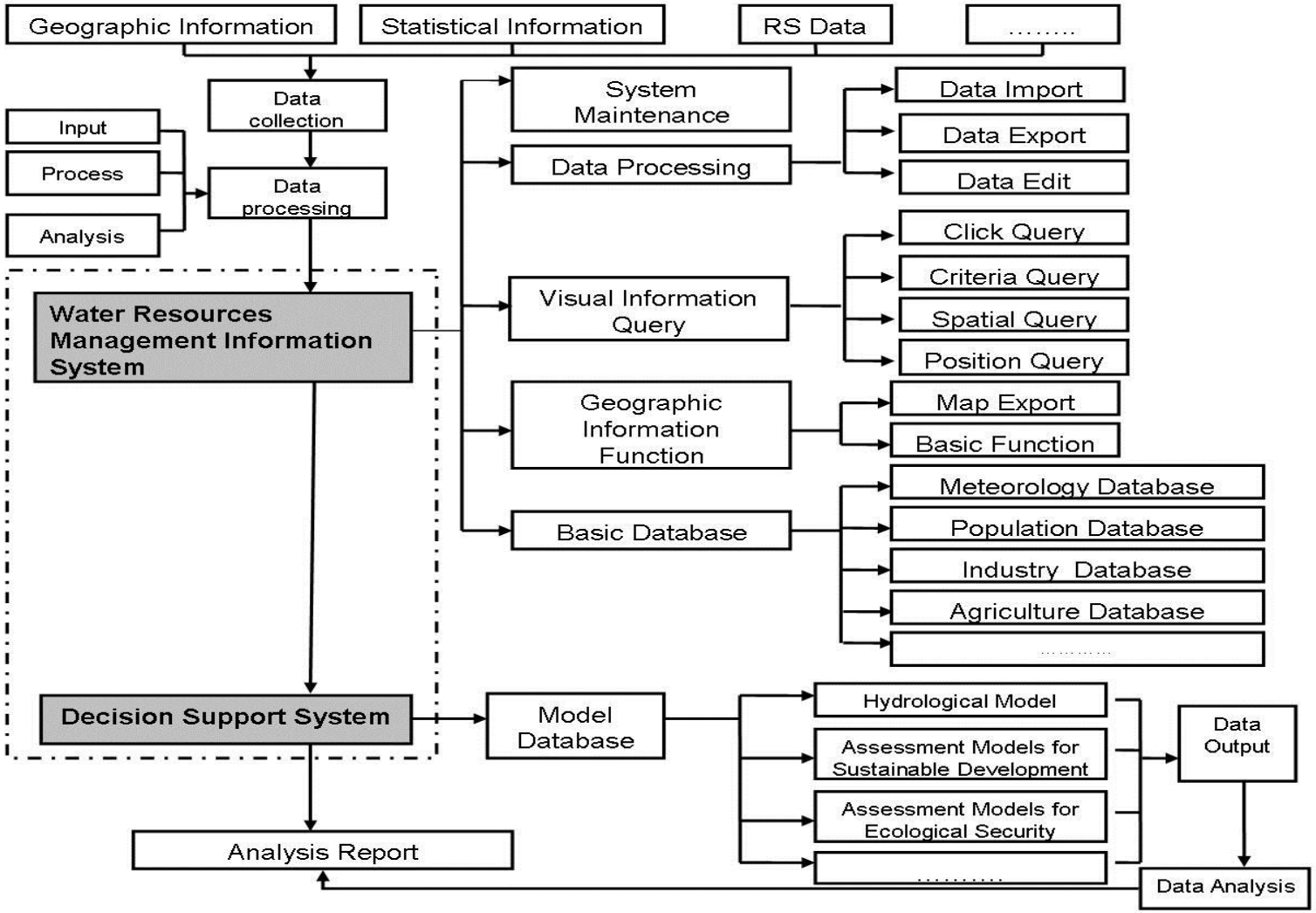
Water Information Management System for Urumqi

乌鲁木齐水资源信息管理系统



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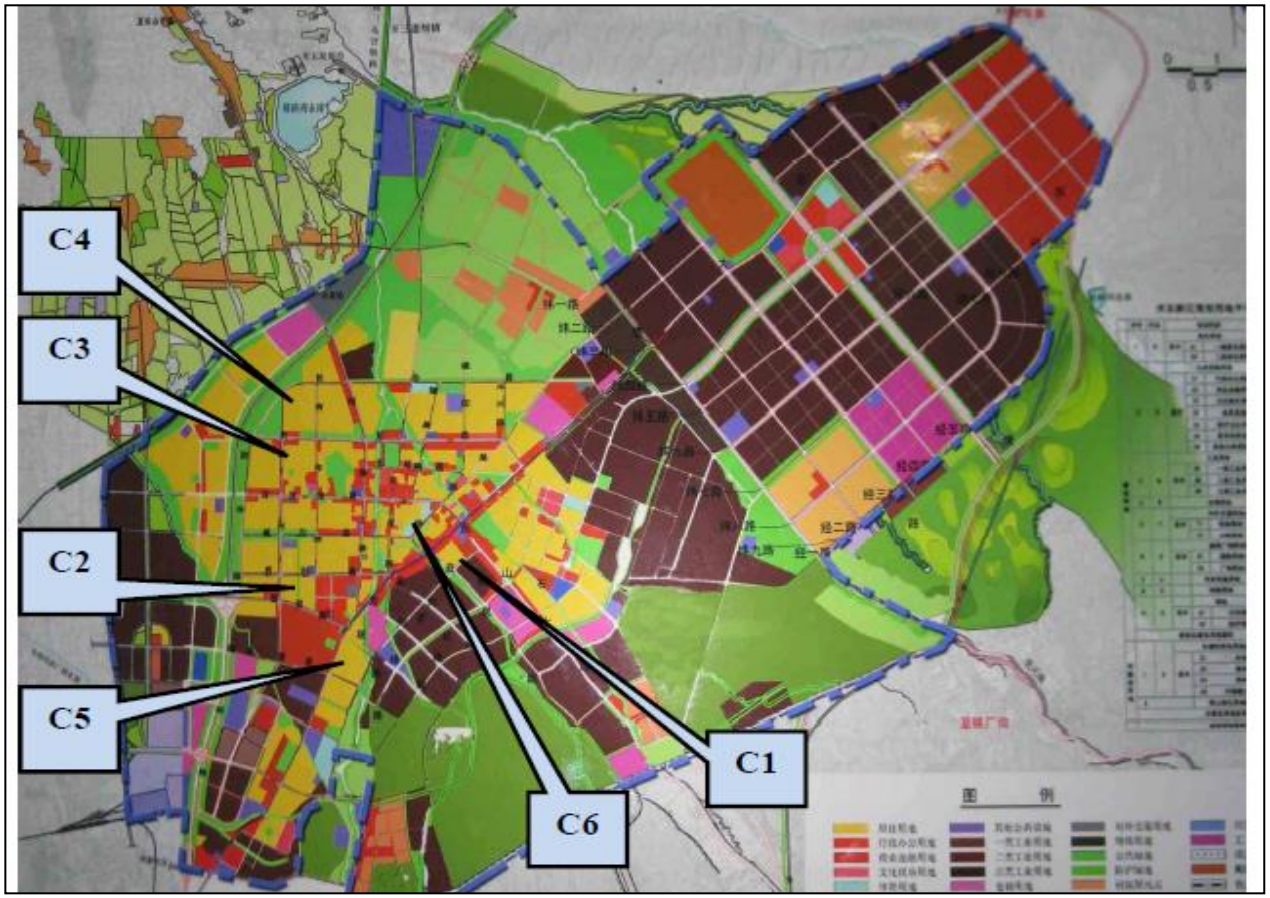
Water Information Management System for Urumqi
乌鲁木齐水资源信息管理系统



Chosen districts in Midong:
C1=Dipang,
C2=Tonghui,
C3=Bafang,
C4=Yuanyi,
C5=Hongqiao,
C6=Minzhu

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Ahati /Jiao, XJAEPS Urumqi

A Handbook for Low Carbon Planning

CULTUREBRIDGE ARCHITECTS
文化桥建筑设计有限公司

Sustainable Urban Planning Elements for the Dryland Megacity Urumqi

干旱地区大城市乌鲁木齐的
城市建设可持续发展

108 page booklet available for download at www.ifeu.de

A study within the framework of the Urumqi RECAST project under supervision of the IFEU Institute Heidelberg and sponsored by the Federal Ministry of Education and Research (BMBF)
该研究报告是受海德堡能源与环境研究所之委托的研究成果

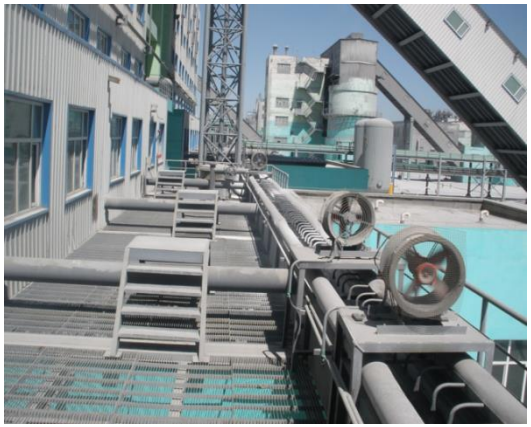
Retrofit to first zero-CO_2 emission building

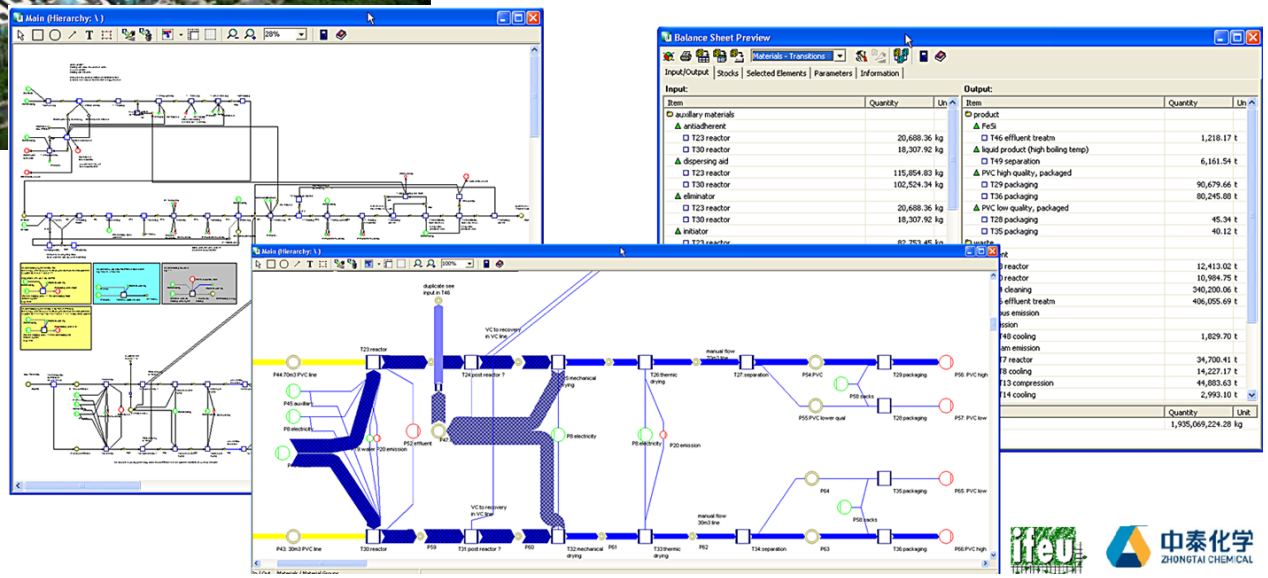
Xingfubao, the first passive house in West China: 85% heat energy reduction

Capacity Building: training of the trainer

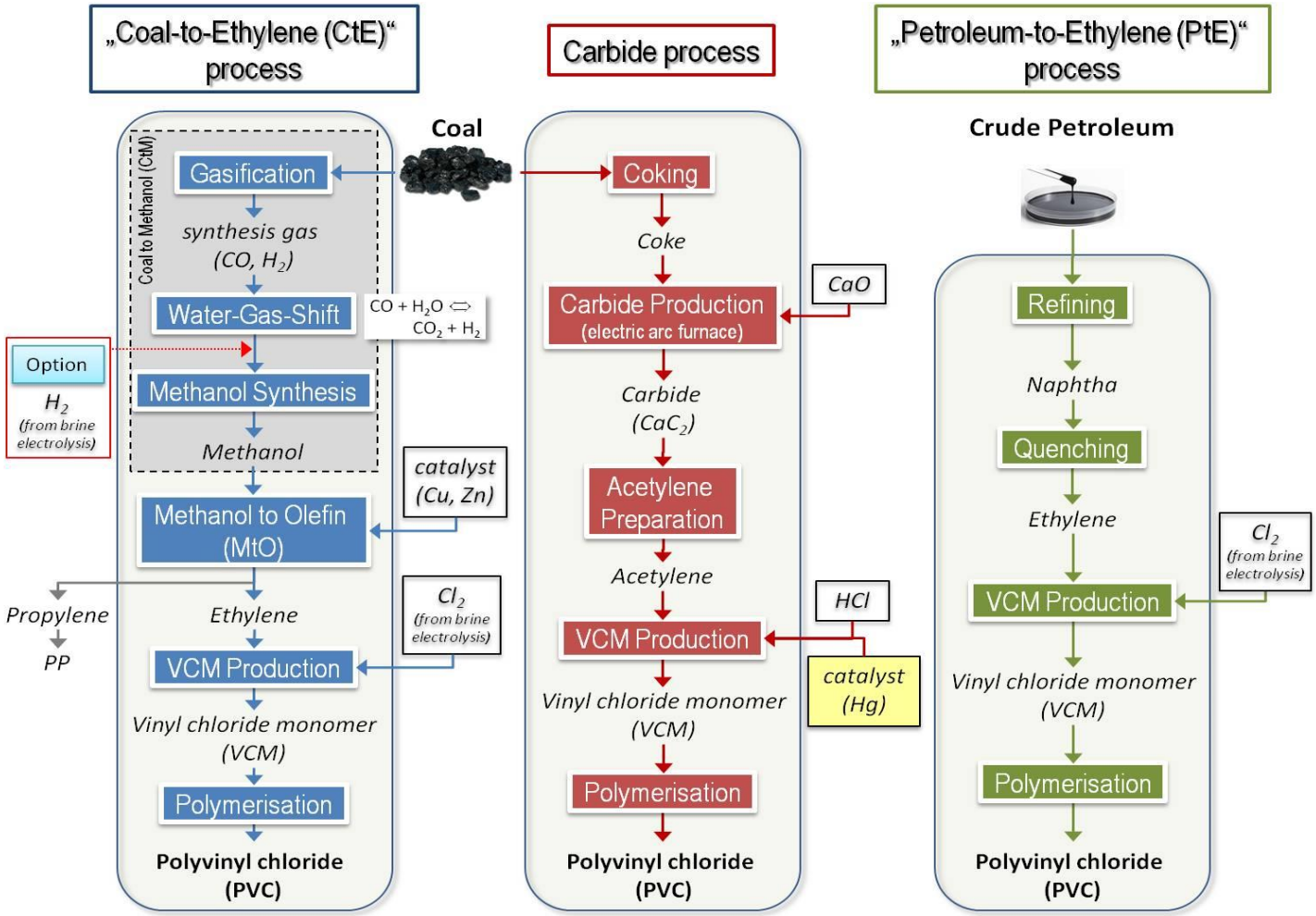
Activity	Avoided CO_2 emissions per year
Direct effects from lighthouse projects	
Retrofit of Nanshan building to extra-low energy consumption	**88**
First passive house in West China (95% energy savings standard), after completion	**210**
Improved energy efficiency of PVC production at ZhongTai Chemical Co. (as of 2011)	**150,000**
Implementation in planning	
Revision of energy efficiency standard for new buildings (2014-2018)	**250,000**
Additional energy efficiency improvements at ZhongTai Chemical Co. (acetylene recovery)	**150,000**
Indirect effects due to recommended policy changes	
One million m^2 of new construction in Urumqi in passive house standard	**27,000**
Retrofit of 10 million m^2 of existing buildings to 65% energy savings standard	**130,000**
Feedstock change (coal->petroleum) for additional PVC production (5 million tonnes per year)	**44,000,000**

Mass and energy flow modeling of ZhongTai PVC factory identifies energy efficiency options





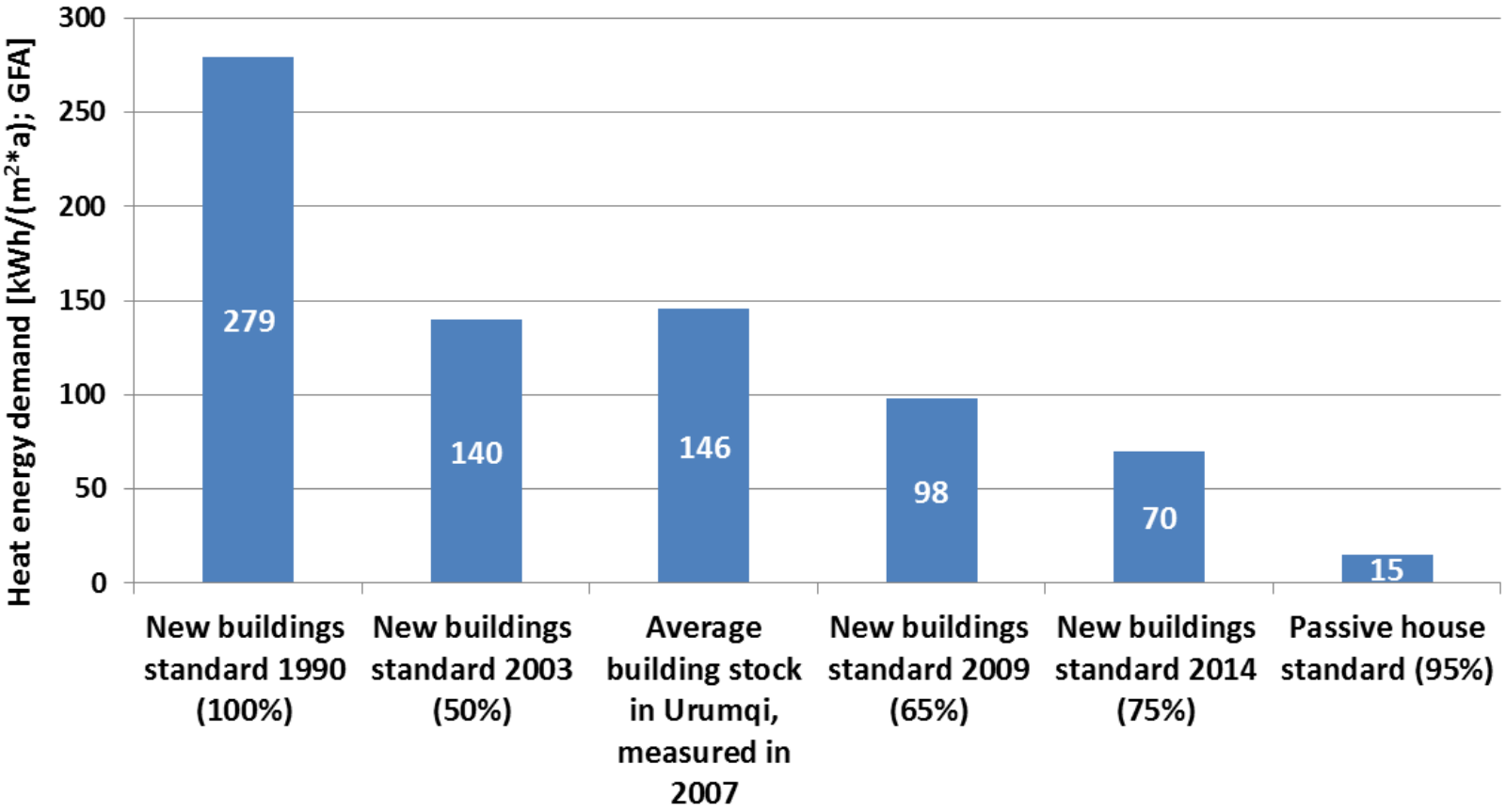
Comparison of PVC production alternatives ´reveals low-carbon options



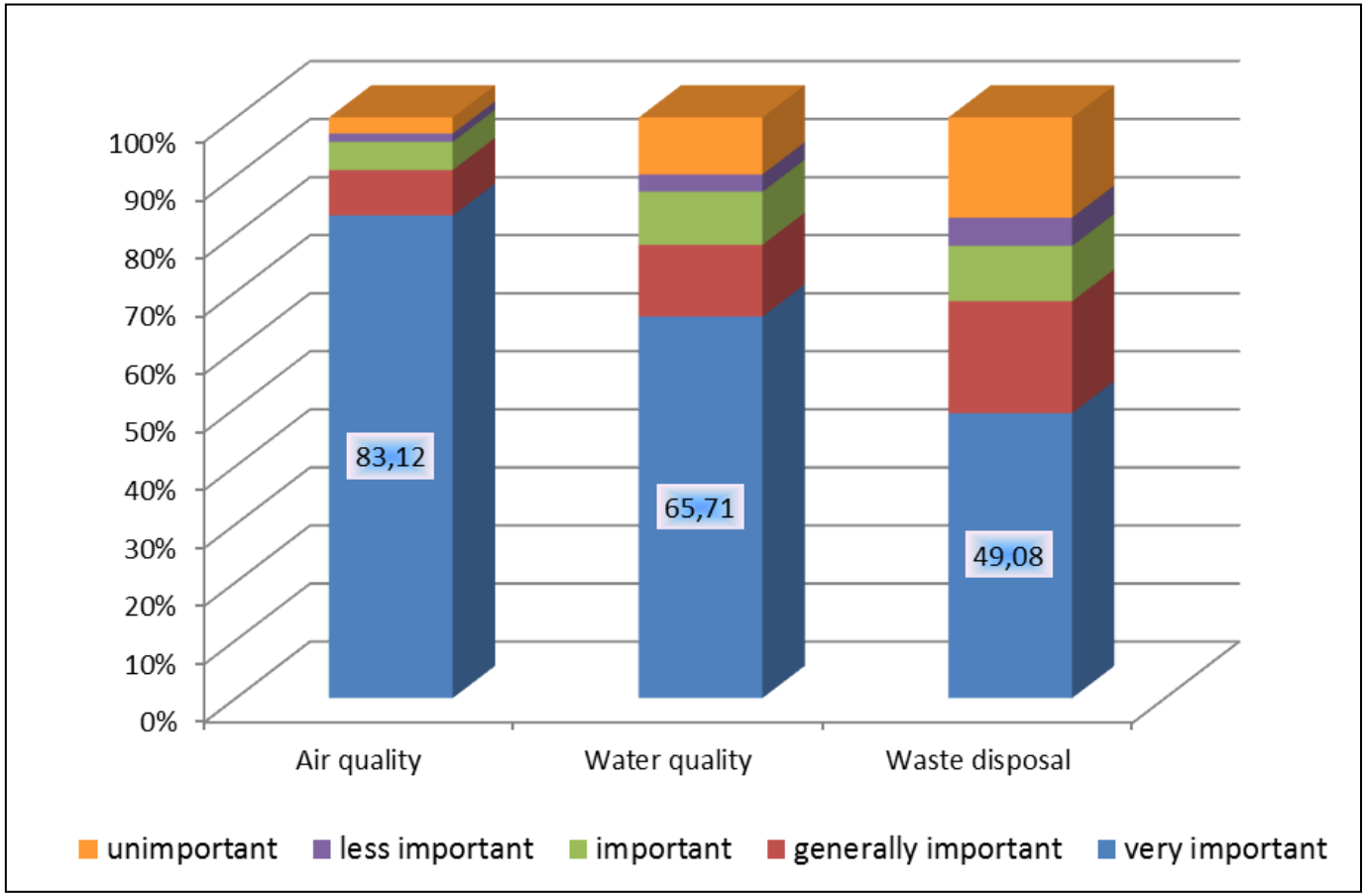
Sino-German student exchange for a sustainable future

Hand-on training in Cottbus on low-energy and high-qualityconstruction

Assisting in developing a stricter energy efficiency standard by 2014



Sensitivity of private households in Urumqi-Midong with respect to aspects of environmental pollution



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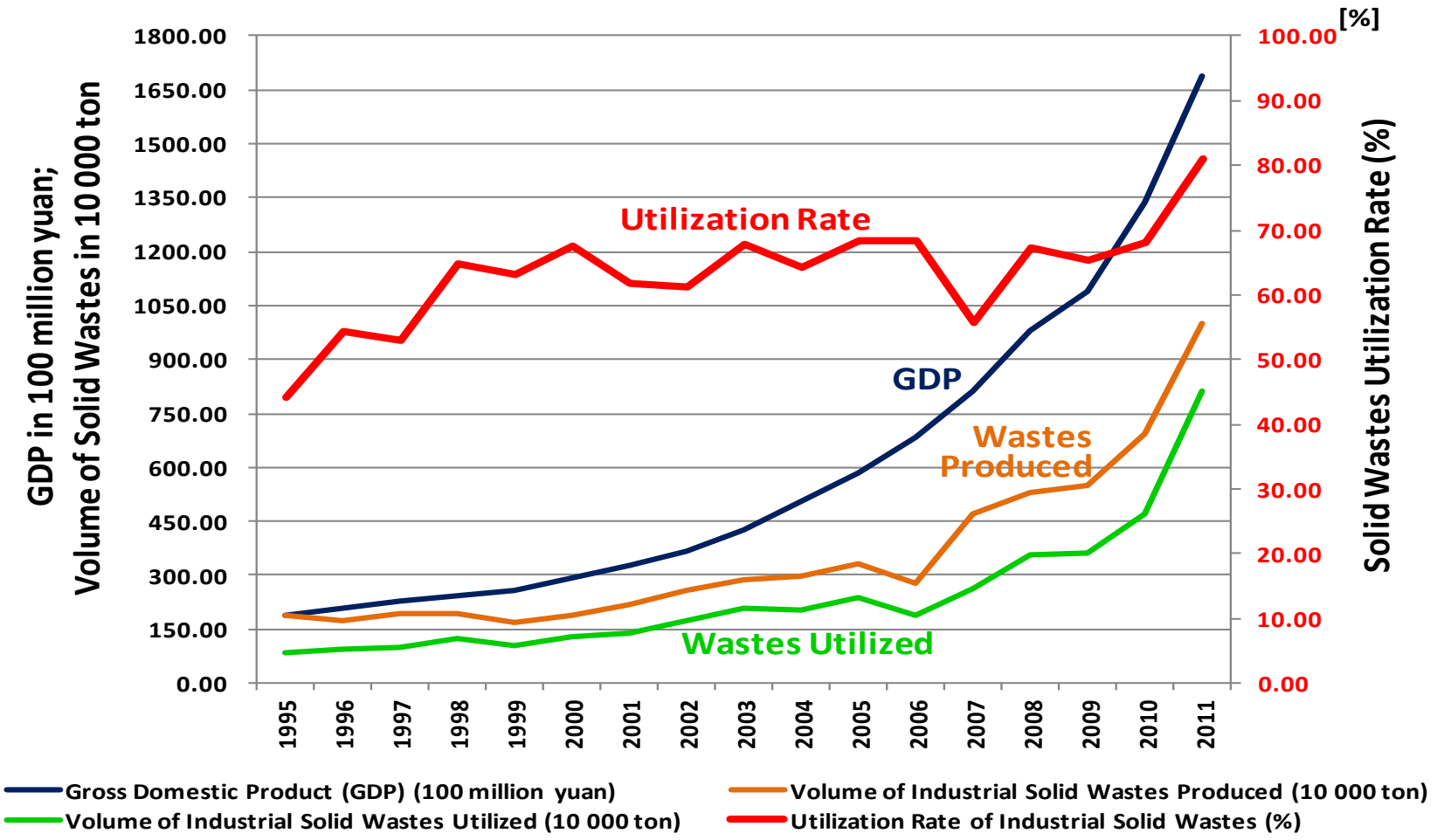
Challenges for Industrial Solid Waste Management



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Waste – The Undesired Downside of Industrial Growth

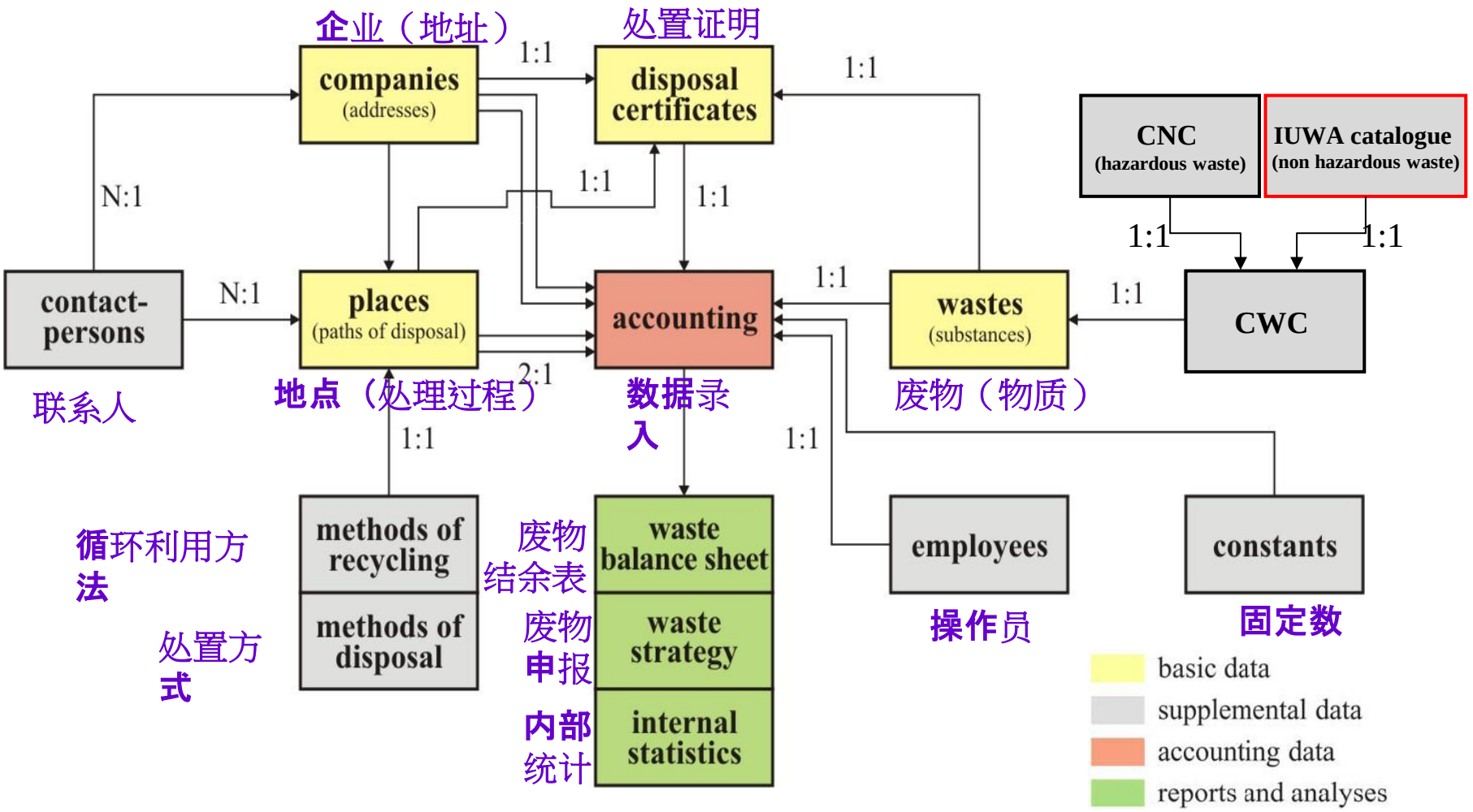
What does the Urumqi's Waste Problem look like?

- Problem of quality
  → industrial waste
  → rise in hazardous waste
- Problem of quantity
  → non-hazardous waste in sharply rising amounts
  → waste of resources

➔ **Circular Economy** as a key
to improve resource efficiency
by reuse and recycling

IUWA Waste Manager: Simplified Entity-Relationship Model

IUWA 废物经理人：各模块之间关系的简要说明



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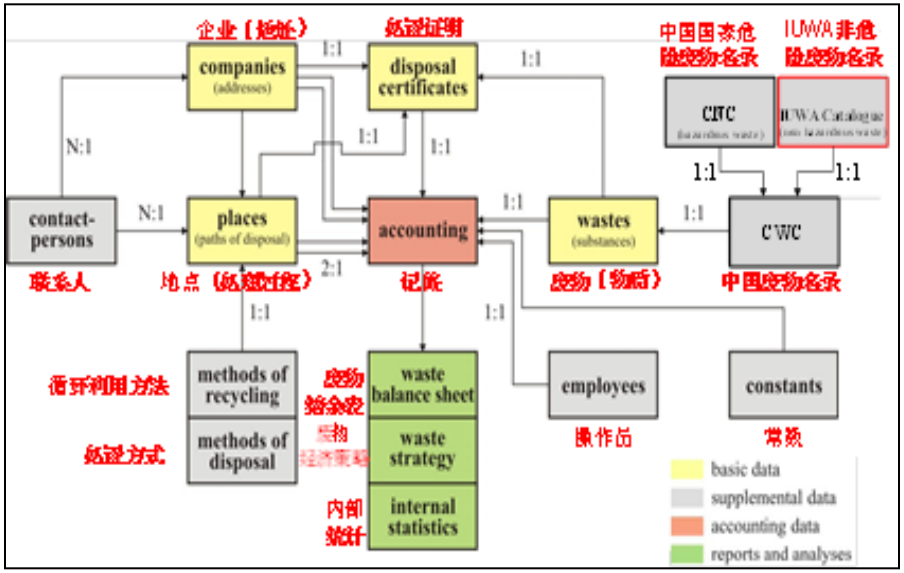
IUWA Waste Manager: Simplified Entity-Relationship Model

IUWA 废物经理人：各模块之间关系的简要说明

*Main menu of **IUWA Waste Manager**.*
Source: IUWA Heidelberg e.V.



*Entity-relationship model of **IUWA Waste Manager.***
Source: IUWA Heidelberg e.V.

Chinese National Catalogue of Hazardous Wastes

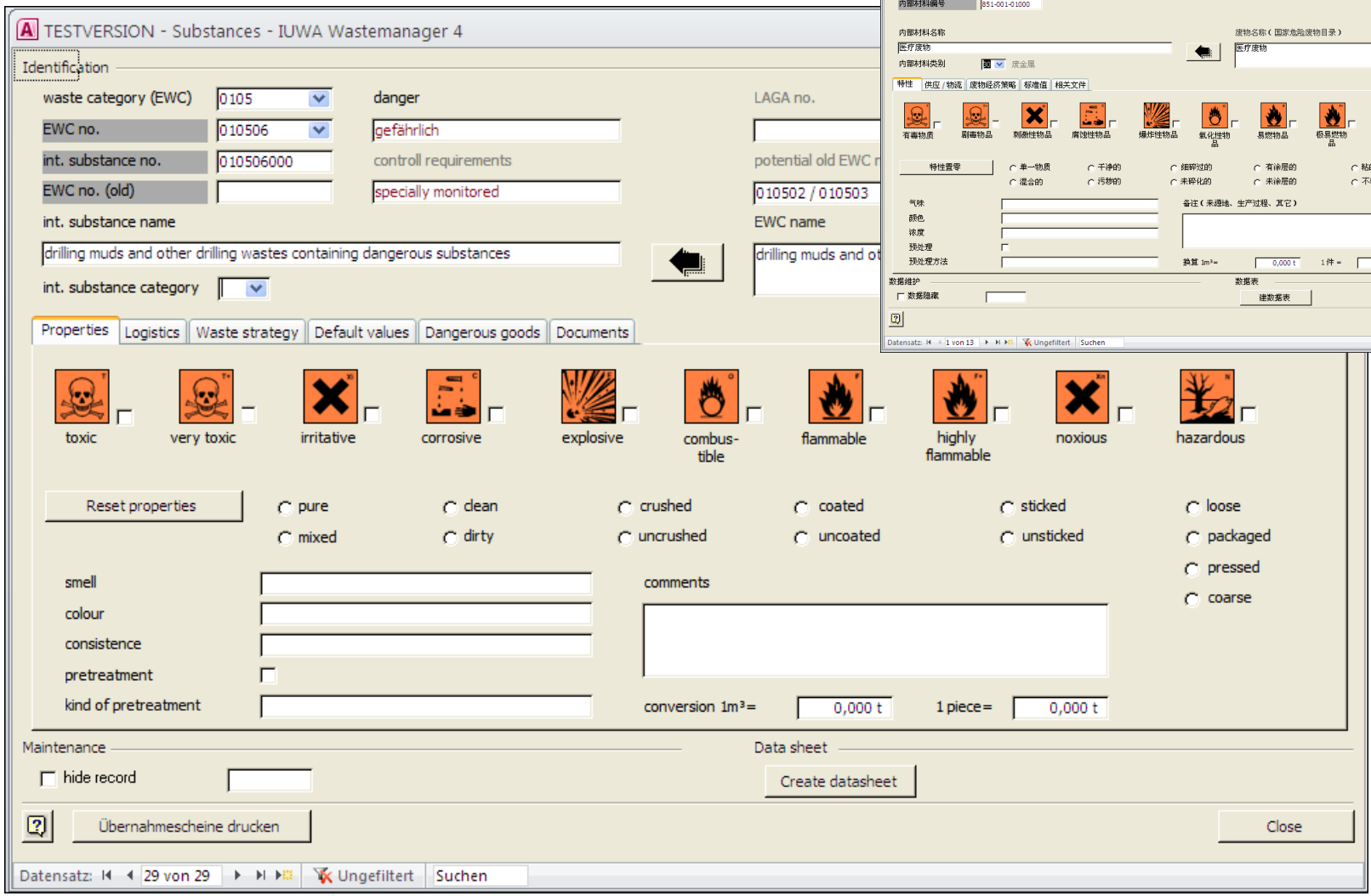
Category of the waste	Source of the Waste	Code of the waste	Hazardous waste	Hazardous properties
HW11 Residues of Rectifying and distillation	Waste from manufacturing of basic chemical raw materials	261-007-11	Distillation residues from the production of acetaldehyde using ethylene	T
		261-008-11	Minor distillation parts from the production of acetaldehyde using ethylene	T
		261-009-11	Substances in the bottom of the distillation kettle by distilling benzyl chloride in its production process	T
		261-010-11	Distillation residues in the process to produce carbon tetrachloride	T
		261-011-11	Substances in the bottom of the distillation kettle from the treating tower in the process to produce epichlorohydrin	T
		261-012-11	Tar in the bottom of the distillation tower in the process to produce phenol and acetone by isopropylbenzene	T
		261-013-11	Residues and light distillation parts in the bottom of the distillation tower in the process to produce o-Phthalic anhydride by naphthalene	T
		261-014-11	Residues and light distillation parts in the bottom of the distillation tower in the process to produce o-Phthalic anhydride by o-Xylene	T

废物类别	行业来源	废物代码	危险废物	危险特性
HW11 精（蒸）馏残渣	基础化学原料制造	261-007-11	乙烯法制乙醛生产过程中产生的蒸馏残渣	T
		261-008-11	乙烯法制乙醛生产过程中产生的蒸馏次要馏分	T
		261-009-11	苄基氯生产过程中苄基氯蒸馏产生的蒸馏釜底物	T
		261-010-11	四氯化碳生产过程中产生的蒸馏残渣	T
		261-011-11	表氯醇生产过程中精制沥产生的蒸馏釜底物	T
		261-012-11	异丙苯法生产苯酚和丙酮过程中蒸馏塔底焦油	T
		261-013-11	萘法生产邻苯二甲酸酐过程中蒸馏塔底残渣和轻馏分	T
		261-014-11	邻二甲苯法生产邻苯二甲酸酐过程中蒸馏塔底残渣和轻馏分	T
		261-015-11	苯硝化法生产硝基苯过程中产生的蒸馏釜底物	T
		261-016-11	甲苯二异氰酸酯生产过程中产生的蒸馏残渣和高心分离残渣	T
		261-017-11	1, 1, 1-三氯乙烷生产过程中产生的蒸馏底渣	T
		261-018-11	三氯乙烯和全氯乙烯联合生产过程中产生的蒸馏塔底渣	T
		261-019-11	苯胺生产过程中产生的蒸馏底渣	T

Chinese national catalogue of hazardous wastes.
Source: MEP, NDRC.

© IUWA 2012

User Mask: Waste Substances
垃圾废物选择对话框



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Sino-German Waste Management Software – New perspectives for CE within and between Companies

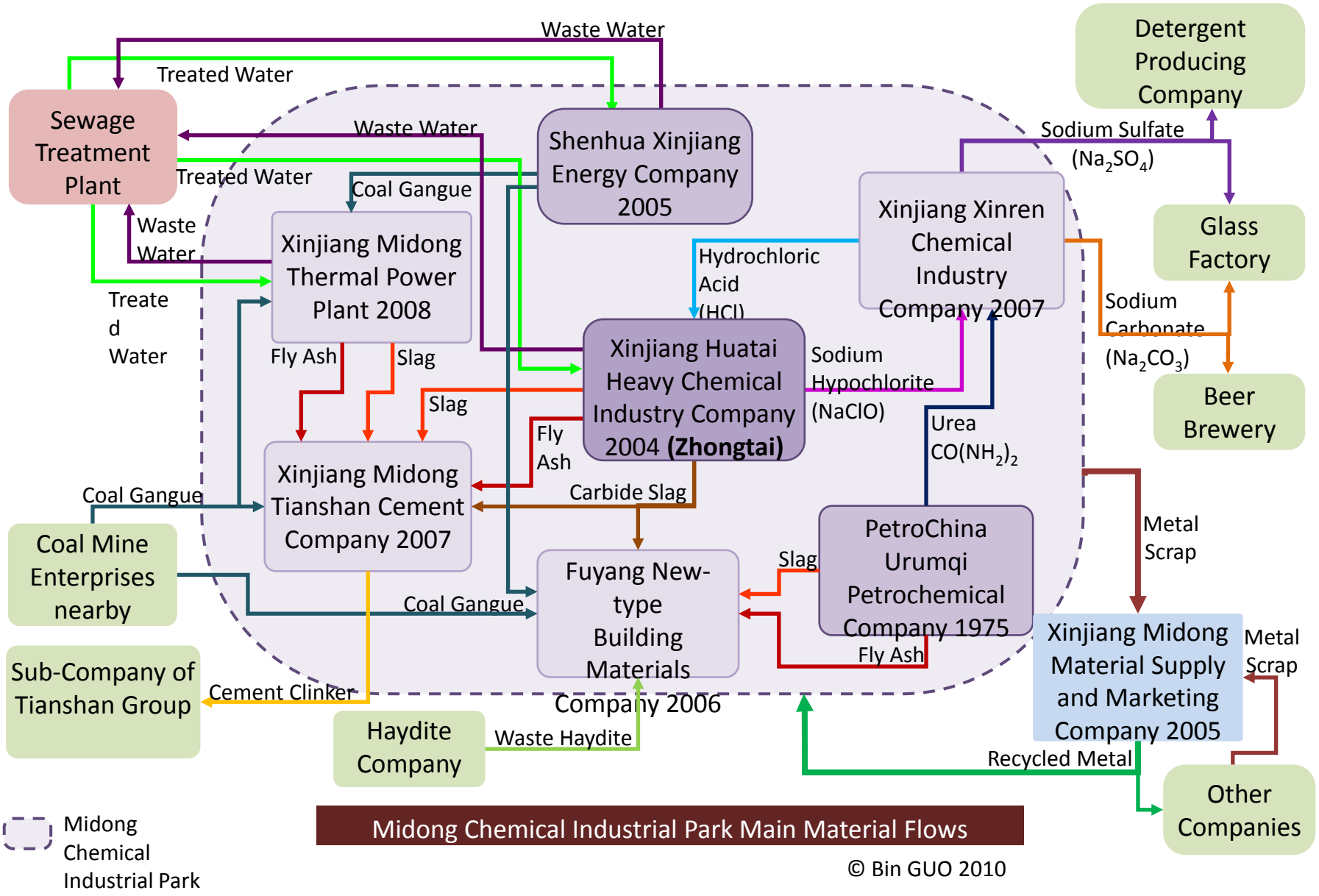
Intra-Company Advantages:

- **Waste categorization** according to the legal framework and above
- Precise, standardized and continuous provision of **waste specific data**
- **Transparency** of waste specific costs and quantities
- Identification of **weak points** and specification of targets for improvement
- Tool for preparation and continuous support of EMS, **ISO 14001**, IMS

Inter-Company Advantages:

- Inter-Company transparency of **aggregated** waste specific **information** (waste specific characteristics, prices, recycling options , …)
- Inter-Company opportunities to discover and implement **Input-Output relationships** in order to close material cycles
- Contributions to **regional resource efficiency** as well as to **decreases in environmental impacts** of industrial production

Circular Economy Approaches in Midong Industrial Park



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Capacity Building within the RECAST Urumqi Project

Whom to train?

Training of the practitioner

Training of the trainer

SRH HOCHSCHULEN

Training of the expert

Training of the next generation

Capacity Building: Training of the Expert

Training of the expert

- Soil moisture proved to be a good proxy to estimate climate change
- Training of scientists of CAS in Xinjiang and Heidelberg on how to measure it with GPR along the northern slope of Tianshan
  → **Patrick Klenk**, Institute for Env. Physics, Heidelberg University
- CAS Xinjiang bought GPR instruments
- In order to continue with the monitoring of soil moisture content along this landscape profile

executed

Capacity Building: Training of the Practitioner

Training of the practitioner

executed

- Industrial waste is a relatively new phenomenon in Urumqi, as industrialisation and „modern“ patterns of consumtion a very new phenomenon
- Therefore, data on waste are scarce, weak, widespread and hardly comparable

- Development of a simple waste management software which is well adapted to the local situation and desires (in close connection with local industrial WM experts)

- Provision of training courses for practitioners and potential trainers from our Chinese partner instiutution (Xinjiang Academy for Environmental Protection Science) **(IUWA)**

Capacity Building: Training of the Practitioner

Nanshan Training Center – Construction Progress in September 2010
(Bernd Franke)

executed

Insulation of walls, roof and ground floor *(left)*

Solar-driven floor-heating *(bottom left)*

Well insulated casket windows *(bottom right)*

Capacity Building: training of the next generation

Training of the next generation

- School exchange between Middle School No. 8 of Urumqi and IGH (International Comprehensive School of Heidelberg)
- focus on environmental sensitivity, and environmentally oriented behaviour with a specific emphasis on energy saving.
- Executed with specific support of the Bosch foundation. (2009 / 2010), **Franke**
- Young people will keep such positive experiences forever

executed

Capacity Building: training of the trainer

Training of the trainer

SRH HOCHSCHULEN

- Exchange between SRH Technical Highschool (Heidelberg, Germany) and the Chemical Technical Highschool of Urumqi (China)

- teachers from Xinjiang Chemical Engineering School came to visit Heidelberg and the SRH in order to inform themselves about concepts for practice-oriented education. (August, November and December 2011, as well as in February 2012)
  (Prof. Weis, SRH)

executed

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For more information

www.urumqi-drylandmegacity.uni-hd.de

co-ordination: thomas.sterr@geog.uni-heidelberg.de

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