



Geowissenschaftliche Fakultät  
**Geographisches Institut**

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Hans-Joachim Rosner

GIS in the Humanities and  
Social Sciences 2009  
Taipei

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# GIS Applications and Web Map Service for the 'Monies, Markets, and Finance in China and East Asia 1600-1900'-Project

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## Structure

- ***The ‘Monies, Markets, and Finance’-project (MMF)***
- ***Qing-time copper transport:  
localisation and reconstruction***
- ***Transportation route analyses***
- ***Visualisations / MMF-Web Map Service***



## Monies, Markets, and Finance in China and East Asia 1600-1900: Local, Regional, National and International Dimensions (Research Group FOR 596, German Research Foundation, DFG)

- Chinese studies, Japanese studies, and geography  
(Tübingen - Heidelberg – Bochum)
- Phase I : 2005 – 2008
- Phase II : 2008 – 2011



### Focus of the Project

- Concrete conditions of coin production: Mining and smelting of mint metals, transport to the mints, casting of coins, and
- Problems related to the functions and exchange rates of different means of payment, the structures of the financial systems, cultural meanings of money.



## MMF-Core Research Groups (2<sup>nd</sup> phase)

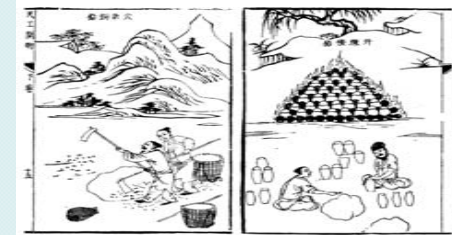
**"Qing Coinage, 1850 to 1911: Mint Statistics, Numismatic Evidence, and Monetary Policy"**



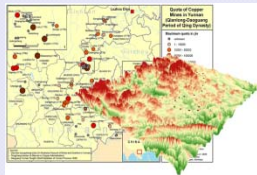
**"Qing Monetary Policies and the Lower Yangzi Economy, 1644 to 1850"**



**Zinc Administration in Southwest China, 1700-1850**



**Qing Mining in Yunnan - Landscape Development, Environmental Change, Cartography, and GIS-based Webmapping**



**Issues in the History of Transport Systems, the Environment and Mint Metal Shipments in Qing China**



**Japanese-Chinese Copper Trade, 17.-19. Centuries: Regional, Interregional and International Aspects**





## Qing-time copper procurement

Copper cash: complementary currency most prevalent in everyday transactions

From 1738 on: Japanese restrictions on copper export, substitution found in Yunnan

Difficulties after the shift to Yunnan copper:

- a) necessity of profound reorganisation of the copper procurement,
- b) huge amount of copper,
- c) very long distance from Yunnan - Beijing,
- d) transport from the mines to the through the rough terrain in Yunnan.





## Data (selection)

### Historical Documents

„Manual on Copper Administration“ (Tongzheng Bianlan, 銅政便覽)

### GIS and RS data

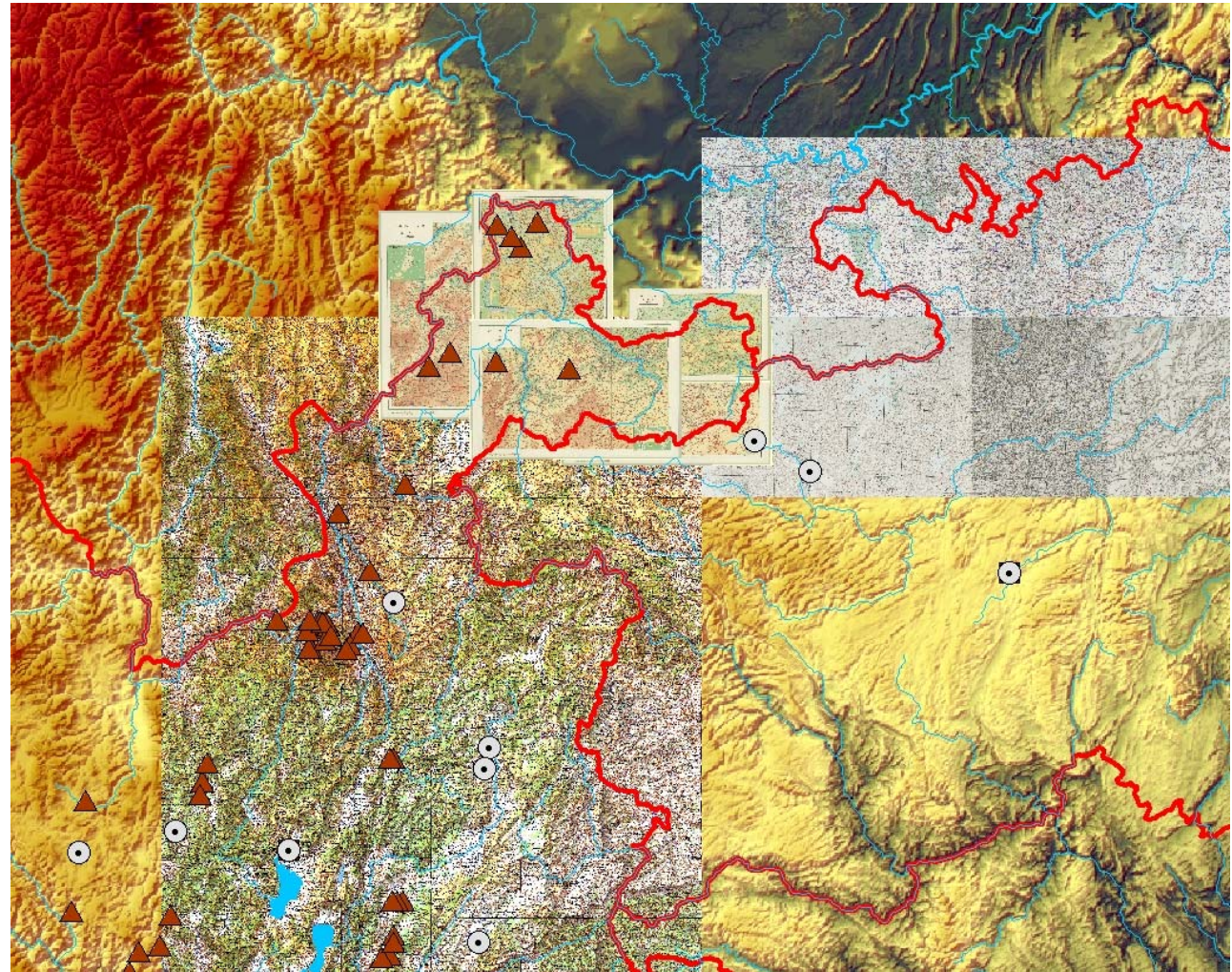
CHGIS (version 4, Harvard  
Yenching Institute 2007)

### Maps

Atlas of cultural relics of  
China – part Yunnan"  
(Zhongguo Wenwu Dituji /  
Yunnan Fence 中国文物地  
图集 / 云南份册)

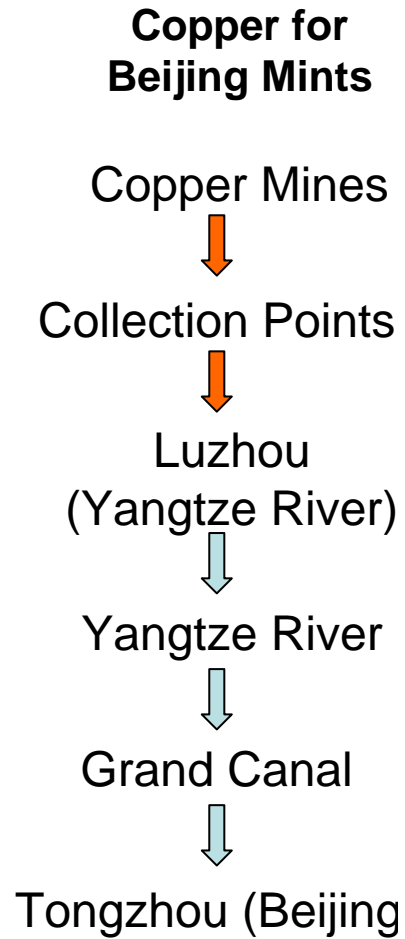
US and SU military maps

Chinese provincial atlases





## Locating mints, mines and routes



### Copper transportation route from Luzhou to Beijing

(from transportation data base: tr\_id 363)

#### Legend

- Places in archival reports
- Transportation route
- River
- Lake
- Border of province (1820)

Baling xian A: date of arrival  
D: date of departure

Data basis: CHGIS, Harvard Yenching Institute  
DEM Data CHGIS V4:  
topographic background image and raster data derived from GTOPO-30 DEM data.

Cartography: Stefan Dieball March 2009



0 75 150 300  
Kilometers

Monies, Markets and Finance  
in China and East Asia  
1600 - 1900

Dr. H.-J. Rosner, S. Dieball & H. Liu 2008  
Department of Geography  
University of Tübingen, Germany

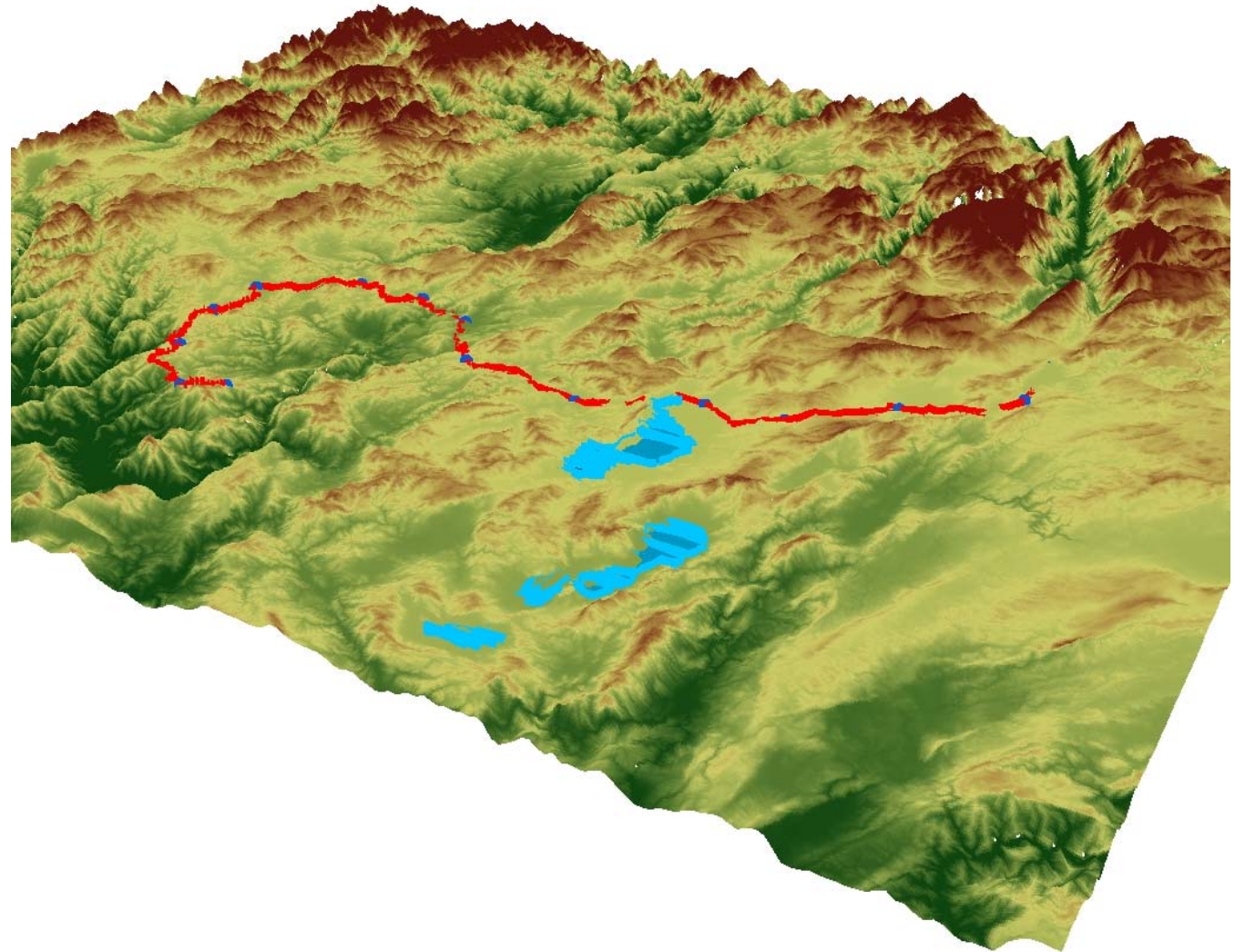


## Route-Analyses

### 3D-Route Analyses

SRTM (Shuttle Radar  
Topography Mission,  
February 2000)

GIS data







## The *li*-Problem (*li* = 里, Chinese Mile)

Stage	Dist. doc. in <i>li</i>	Dist. Doc. in km ( <i>li</i> = 576m)	Dist. GIS in km	Ratio Dist. Doc/ Dist. GIS
Kunming – Banqiao	40	23.04	21.57	1.07
Lühe – Chuxiongfu	60	34.56	22.62	1.53
Shezi – Lufeng	90	51.84	21.55	2.41
Yaodianzi-Laocunzi	60	34.56	22.79	1.52
Xiangduo - Shazuo	50	28.8	26.46	1,09
Sanying - Shaping	90	51.84	38.78	1,34

→ The route reconstruction was (completely) wrong **OR**  
official distance in *li* does not give the real distance



# The Li Problem

2\_info\_Fabiao Zhen-Yulong - Editor

Datei Bearbeiten Format ?

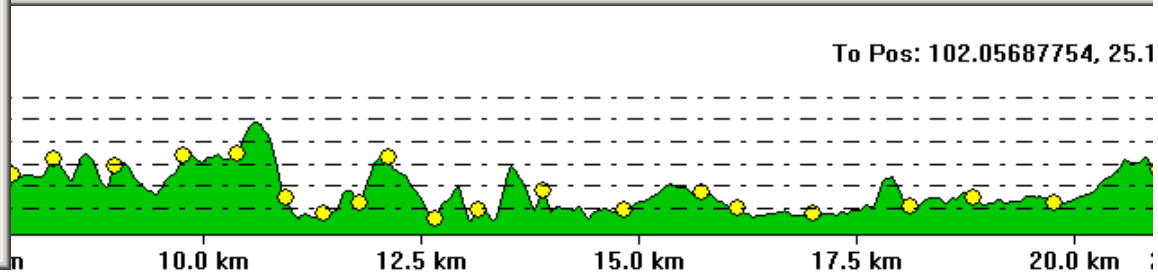
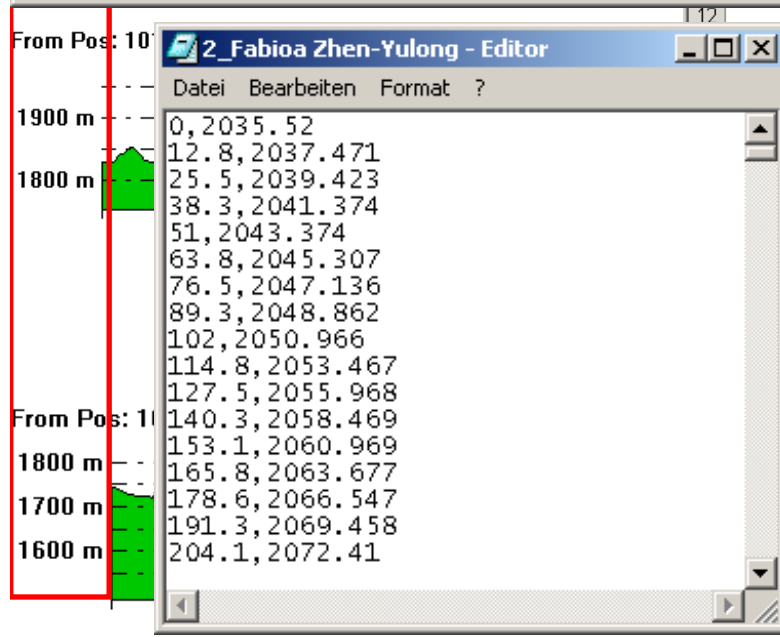
Start Position: 101.84655296, 24.59850284  
Start Height: 2035.52 m  
End Position: 101.74960298, 24.56535220  
End Height: 1876.1 m  
Straight-Line Distance: 6.52 miles  
3D Distance on surface: 6.67 miles  
Vertical Difference (Start to Finish): -159.4 m  
Minimum Elevation on Path: 1872.283 m  
Maximum Elevation on Path: 2304.493 m  
Azimuth: 249.4°  
Tilt: -0.87°

ipo-Xundian

File Edit Insert Format Extras Daten Fenster Help Adgbe PDF

from...to...

	C	D	E	F	G
ipo Fabiao Zhen		Fabiao Zhen		Yulong	Yulong
		Start Position		101.84655296, 24.59850284	Start Position
		Start Height		2035.52 m	Start Height
		End Position		101.74960298, 24.56535220	End Position
		End Height		1876.1 m	End Height
		Straight-Line Distance		6.52 miles	Straight-Line Dist
		3D Distance on Surface		6.67 miles	3D Distance on S
		Vertical Difference (Start to Finish)		-159.4 m	Vertical Differenc
		Minimum Elevation on Path		1872.283 m	Minimum Elevatic
		Maximum Elevation on Path		2304.493 m	Maximum Elevati
		Azimuth		249.4°	Azimuth
		Tilt		-0.87°	Tilt
	X	X		0.0	2.035.520
				12.8	2.037.471
				25.5	2.039.423
				38.3	2.041.374
				51.0	2.043.374
				63.8	2.045.307
				76.5	2.047.136
				89.3	2.048.862



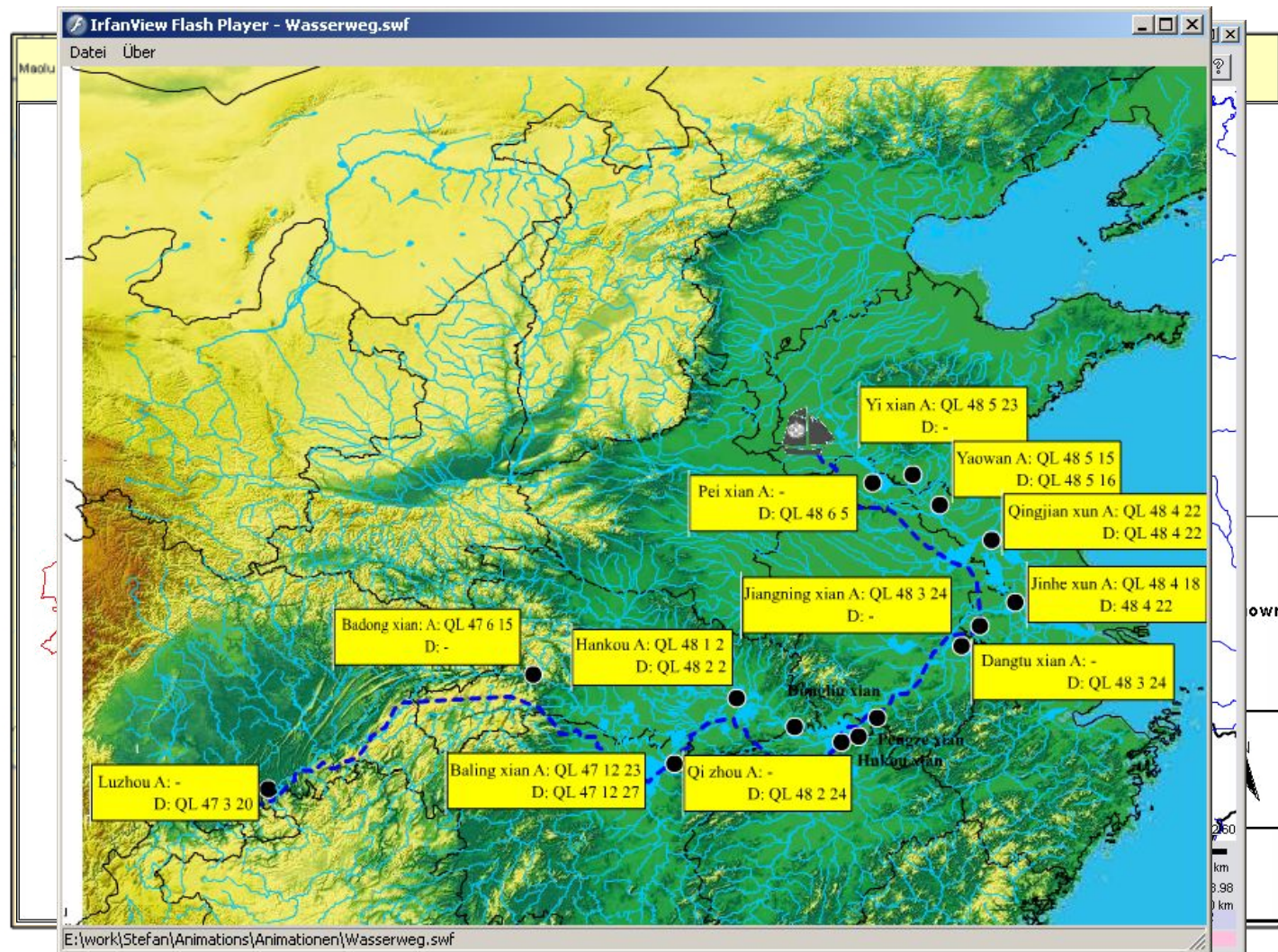


	Dist. GIS [m]	Ratio Doc/ GIS	Cumulative elevation gain / loss [m]	Cum. elev. gain+loss / Dist. GIS m]
Kunming - Banqiao:	21578	1.07	$\frac{(+)\ 337 / (-)\ 287}{664}$	0.031
Lühe - Chuxiongfu	22624	1.53	$\frac{(+)\ 1076 / (-)\ 1120}{2196}$	0.097
Shezi - Lufeng	21355	2.41	$\frac{(+)\ 1995 / (-)\ 2150}{4145}$	0.192
Yaodianzi-Laocunzi	22790	1.52	$\frac{(+)\ 1449 / (-)\ 1091}{2540}$	0.112
Xiangduo - Shazuo	26462	1.09	$\frac{(+)\ 473 / (-)\ 898}{1371}$	0.051
Sanying - Shaping	38780	1.34	$\frac{(+)\ 864 / (-)\ 927}{1791}$	0.046

→ A *li* is not a measure for the length of a route in a strict sense  
but a time measure.



## Visualisation: maps and animations

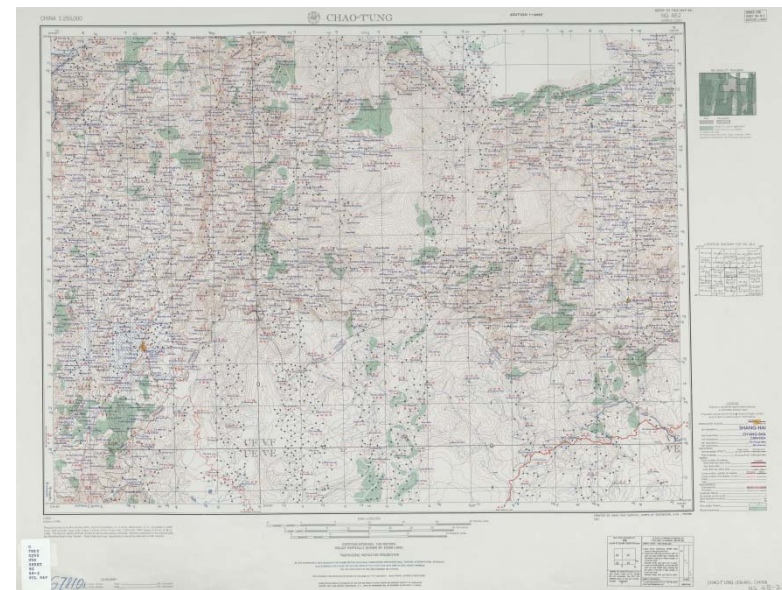




## Visualisation: Web Map Service

### Aims:

- Web-based access to maps and GIS-data
  - availability of cartography functions for other researchers
  - availability of GIS-functions
  - complete own administration
  - no software costs
- **Web Map Service (WMS)**

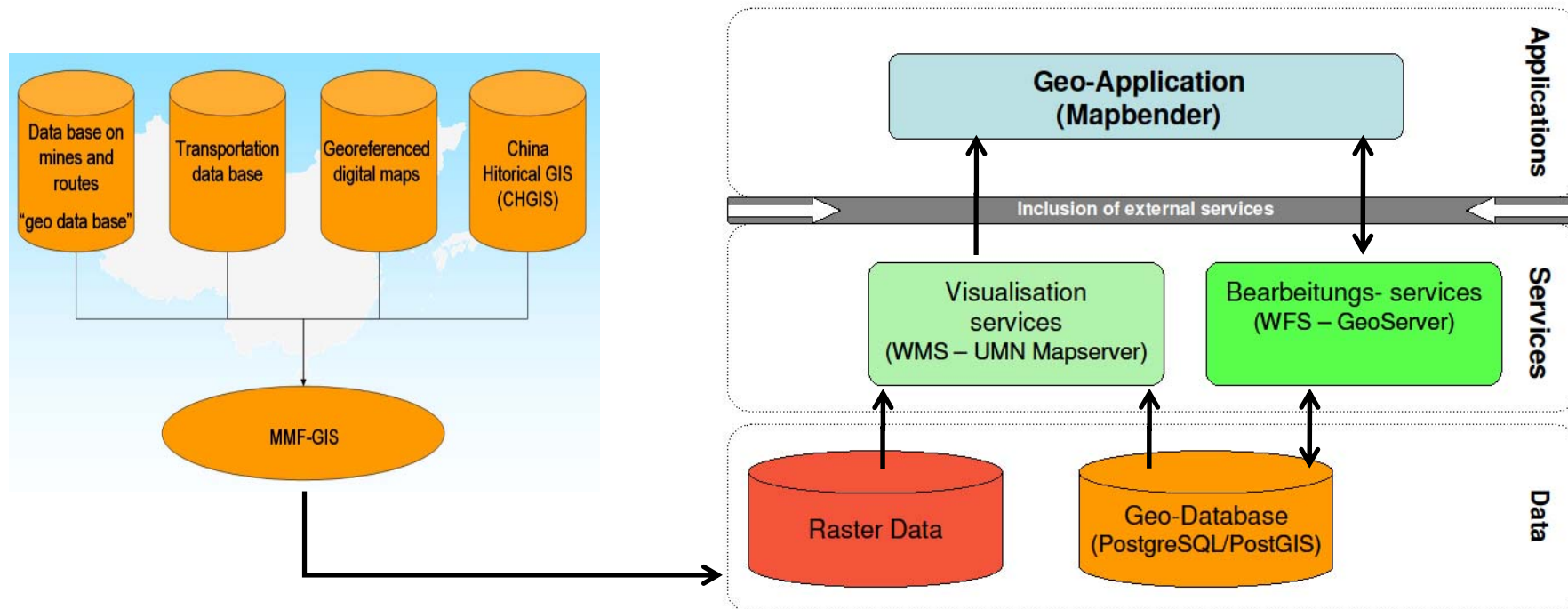




## MMF-WMS

### MMF - WMS

WWW-Server, Geography Department, Tübingen





# Monies, Markets, and Finance WMS

## MMF-WMS

Vers. 0.93 beta



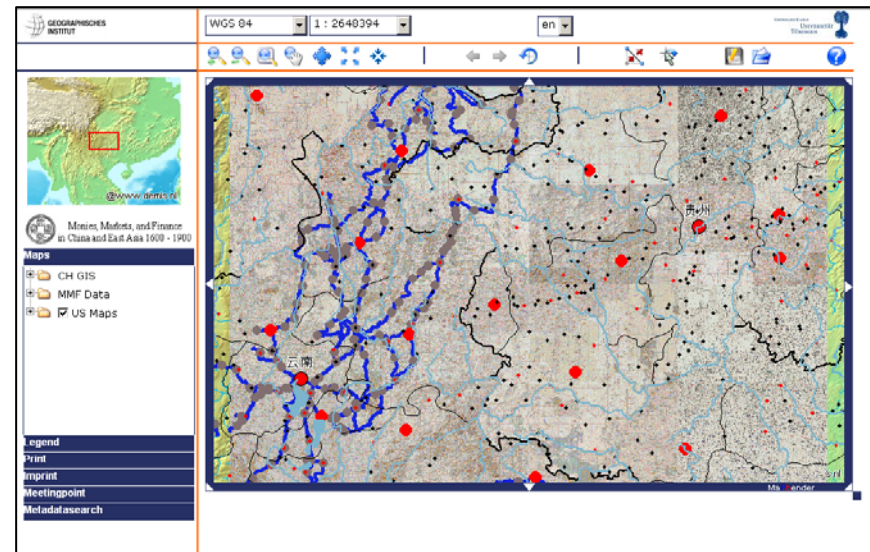
The screenshot shows a web browser window displaying a map of Yunnan, China. The browser title is "testlayout\_SD - presented by Mapbender - Mozilla Firefox". The address bar shows the URL "http://134.2.148.86:8080/mapbender/frames/index.php?&gui\_id=testlayout\_SD". The map interface includes a toolbar with navigation and zoom controls, a legend, and a sidebar with map layers and metadata options. The map itself shows a detailed view of Yunnan, China, with various geographical features and labels in both Chinese and English. A red dot is visible on the map, and a blue line indicates a route or boundary. The sidebar on the left contains a "Maps" section with "CH GIS", "MMF Data", and "US Maps" (checked). Below the sidebar are options for "Legend", "Print", "Imprint", "Meetingpoint", and "Metadatasearch".



## Monies, Markets, and Finance WMS

### Data & Features

- CH-GIS data
- MMF-data
- topographic maps (US-Army maps 1:250.000, 1954)
- cartography- and GIS-functions (selection of data, pan, zoom, measure, change of coordinate systems, identify, print...)



### Still to come

- more data
- query function
- better print layout
- digitize function
-





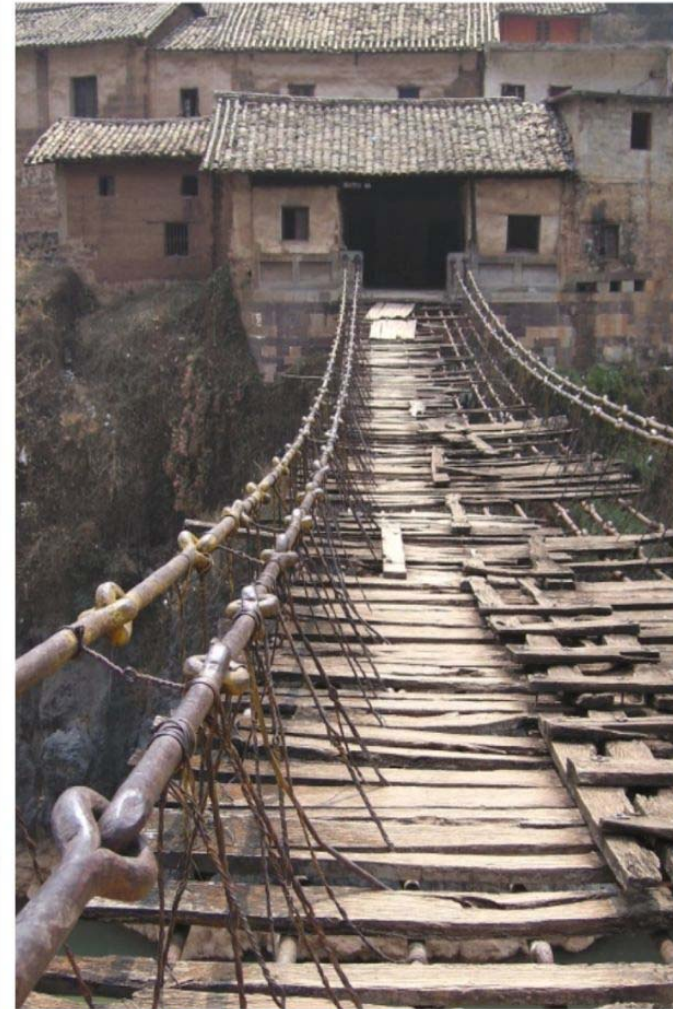
[www.monieseastasia.uni-tuebingen.de](http://www.monieseastasia.uni-tuebingen.de)



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[hans-joachim.rosner@uni-tuebingen.de](mailto:hans-joachim.rosner@uni-tuebingen.de)



The 19<sup>th</sup> century chain bridge in Jiangdi, Yunnan, used for copper transport.