YREC

Water Resources Planning for Yellow River Basin (YRB)

黄河流域水资源规划

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Overview

1 Key issues to be addressed in water resources planning of YRB
2 Status quo of water resources exploitation & utilization, YRB
3 Water demand of YRB
4 Water allocation scheme of YRB
5 Countermeasures

主要内容

1 黄河流域水资源规划解决的主要问题
2 黄河流域水资源及其利用现状
3 黄河流域用水需求
4 黄河水资源配置
5 对策措施

1 Key issues to be addressed in water resources planning of YRB

1 黄河流域水资源规划解决的主要问题

Water resources estimation under the climate and landscape change

Systematical assessment for the status quo of water resources development & utilization

Water demand for socio-economical development and environment

Water allocation scheme

Countermeasures

气候及下垫面变化情况下水资源量评价

水资源开发利用现状的系统评价

预测经济社会发展和生态环境变化趋势以及对水资源的要求

水资源配置

主要对策措施

2 Status quo of water resources exploitation & utilization, YRB

2 黄河流域水资源及其利用现状

(1) Water resources quantity

- Under current situation, the annual average runoff of YRB is 53.5 billion m^3, which is 4.5 billion m^3 less than before.
- Due to the impact of human activities, it is estimated that the runoff is likely to decrease in the future.

（1）水资源量

现状下垫面条件下，黄河流域天然径流量535亿m^3，比原来的580亿m^3，少了45亿m^3。

由于人类活动的影响，预测未来径流量还有减少的趋势。

2 Status quo of water resources exploitation & utilization, YRB

2 黄河流域水资源及其利用现状

(2) Water resources utilization

- According to the statistics, the total water supplied in 2010 is 51.2 billion m^3, compromising 38.5 billion m^3 surface water and 12.7 billion groundwater.
- Water supplied to YRB is 40.6 billion m^3, while water supplied outside YRB is 10.6 billion m^3.

（2）水资源开发利用现状

据2010年统计，黄河流域供水量512亿m^3，其中地表水供水385亿m^3，地下水供水量127亿m^3。

向流域内供水量406亿m^3，向流域外供水量106亿m^3。

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2 Status quo of water resources exploitation & utilization, YRB

2 黄河流域水资源及其利用现状

Water supply of YRB in year 2010

	地表水 Surface water	其中向流域外供水water supplied outideYRB	地下水 Ground water	其他 Others	合计 Sum
青海(Qinghai)	14.5		3.6		18.1
四川(Sichuan)	0.3		0.0		0.3
甘肃(Gansu)	40.0	1.6	6.2		46.2
宁夏(Ningxia)	67.7		5.4		73.1
内蒙古 (Inner Mongolia)	77.2	0.5	26.0		103.2
陕西(Shanxi)	30.6		30.2		60.9
山西(Shanxi)	21.1		23.5		44.6
河南(Henan)	47.2	26.5	22.9		70.1
山东(Shandong)	76.0	67.0	9.4		85.5
河北、天津 (Hebei&Tianjing)	10.2	10.2			10.2
合计(Sum)	384.8	105.8	127.2	0.0	512.1

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2 Status quo of water resources exploitation & utilization, YRB

2 黄河流域水资源及其利用现状

Water use of YRB in year 2010

省区(Provinces)	生活 Domestic	工业 Industry	农业 Agriculture	生态 Ecology	合计 Sum
青海(Qinghai)	2.7	2.7	12.6	0.1	18.1
四川(Sichuan)	0.0	0.0	0.3	0.0	0.3
甘肃(Gansu)	5.5	13.3	25.5	0.3	44.6
宁夏(Ningxia)	1.8	9.0	60.9	1.4	73.1
内蒙古 (Inner Mongolia)	4.7	10.7	86.1	1.3	102.7
陕西(Shanxi)	11.7	23.3	24.9	0.9	60.9
山西(Shanxi)	7.7	8.5	25.8	2.5	44.5
河南(Henan)	5.3	19.3	17.7	1.2	43.6
山东(Shandong)	3.0	2.8	12.2	0.5	18.5
河北、天津 (Hebei&Tianjing)	42.5	89.6	266.0	8.2	406.3

2 Status quo of water resources exploitation & utilization, YRB

2 黄河流域水资源及其利用现状

(3) Challenges for current water resources exploitation & utilization

- Water scarcity
- Dramatic increase in water demand
- Serious water pollution
- Incomplete water management

（3）黄河流域水资源开发利用面临的形势

水资源总量不足

用水需求增长快

水污染严重

管理手段还有待提高

3 Water demand of YRB
3 黄河流域用水需求

The trend of socio-economic development and environment evolution

- **Socio-economic development in next 20 years:**
  - **Rapid socio-economic development;**
  - **Ongoing increase of urban population**
  - **Booming in energy sector and heavy chemical industry**
  - **Increase of water demand**
- **High water demand for inner-channel water demand regarding the sediment load feature of YR**

黄河流域经济社会发展和生态环境变化趋势

—预测未来20年内，黄河流域经济社会发展速度将保持较高水平，城镇人口将持续增加，能源及重化工行业增长快，对水资源的需求增长大。

—鉴于黄河多沙的特点，河道内用水需求仍将维持较高水平。

3 Water demand of YRB
3 黄河流域用水需求

Water demand of YRB

省区 Provinces	Water demand in year 2020			Water demand in year 2030		
	YRB	Outside YRB	Sum	YRB	Outside YRB	Sum
青海(Qinghai)	25.9		25.9	27.7		27.7
四川(Sichuan)	0.3		0.3	0.4		0.4
甘肃(Gansu)	60.0	2.0	62.0	62.6	6.0	68.6
宁夏(Ningxia)	86.4		86.4	91.2		91.2
内蒙古 (Inner Mongolia)	107.1		107.1	108.9		108.9
陕西(Shanxi)	90.3		90.3	98.1		98.1
山西(Shanxi)	65.9	5.6	71.5	69.9	5.6	75.5
河南(Henan)	60.7	20.7	81.4	63.3	20.7	84.0
山东(Shandong)	24.6	58.8	83.4	25.5	58.8	84.3
河北(Hebei)	0.0	6.2	6.2	0.0	6.2	6.2
合计(Sum)	521.1	93.3	614.5	547.4	97.3	644.7

4 Water allocation scheme of YRB
4 黄河流域水资源配置

- Maintain a healthy life and promote sustainable socio-economic development
- Based on “87” Water Division Scheme
- Coordinate life, production, eco-water relationship
- Integrate upper, middle and lower reaches of YR
- Surface water, groundwater unified configuration
- Ensure discharged water in main stream and tributaries

- 维持黄河健康生命和促进经济社会可持续发展
- 以“87”分水方案为基础
- 协调好生活、生产、生态用水
- 上、中、下游统筹兼顾
- 地表水、地下水统一配置
- 干支流下泄水量控制

4 Water allocation scheme of YRB
4 黄河流域水资源配置

- **Schemes setting and comparison**

  Several schemes were proposed considering the following aspects:

  - **Less water and more sand; uncoordinated relationship between water and sediment ;**
  - **Coordinate relationship of domestic, production and ecological water demand ; and that of upper, middle and lower reaches**

- **配置方案设定与比选**

  在黄河水资源配置中，针对黄河水少沙多、水沙关系不协调的特点，考虑生活、生产、生态用水关系以及上中下游的用水关系分别提出了各种不同的配置方案，经过分析论证，提出了黄河水资源配置方案。

4 Water allocation scheme of YRB
4 黄河流域水资源配置

- Different stages for water allocation
  - from present to the operation of the eastern & middle routes of the South-North Water Diversion Project (SNWDP)
  - from operation of the eastern & middle routes of SNWDP to the operation of western routes of SNWDP
  - after the operation of first stage of western route of SNWDP
- 水资源配置方案阶段划分
  - 现状至南水北调东中线工程生效前
  - 南水北调东中线工程生效后至南水北调西线一期工程生效前
  - 南水北调西线一期工程生效后

4 Water allocation scheme of YRB
4 黄河流域水资源配置

- Present to the operation of the eastern & middle routes of SNWDP
  - Multi-year average natural runoff is 53.479 billion m^3; and the water quantity allocated outside river is 34.116 billion m^3; the water volume entering into the sea is 19.363 billion m^3 .

- 现状至南水北调东中线工程生效前
  - 本次规划采用多年平均地表径流量为534.79亿m^3。在“87”分水方案的基础上配置河道内外水量，配置河道外可利用水量为341.16亿m^3，入海水量193.63亿m^3。

Yellow River water allocation from the present to before the operation of the eastern and middle route of SNWDP (units: hundred million m^3)

The second grade District Provinces(regions)	Water demand	Water volume of configuration to the basin				Water shortage	Water shortage ratio (%)	Consumptive use of surface water		
		Surface water	Ground water	Other	Total			Inside basin	Outside basin	Total
Upper longyangxia	2.44	2.61	0.11	0.00	2.72	0.00	0.0	2.21	0.00	2.21
From Longyangxia to Lanzhou	41.78	28.84	5.30	0.10	34.25	7.53	18.0	21.72	0.40	22.12
From Lanzhou to Hekouzhen	204.40	139.20	18.84	0.69	158.73	45.67	22.3	96.72	1.60	98.32
From Hekouzhen to Longmen	19.40	12.77	4.55	0.10	17.42	1.97	10.2	9.84	5.60	15.44
From Longmen to Sanmenxia	133.72	72.30	47.27	0.79	120.36	13.36	10.0	68.17	0.00	68.17
From Shanmenxia to Huayuankou	29.89	15.37	13.73	0.02	29.12	0.77	2.6	13.53	8.22	21.75
Underside Huayuankou	48.66	24.49	20.13	0.00	44.62	4.04	8.3	23.45	88.99	112.44
Inner Flow Area	5.51	0.91	3.29	0.02	4.22	1.29	23.4	0.72	0.00	0.72
Qinghai	22.63	15.59	3.24	0.03	18.87	3.76	16.6	13.00	0.00	13.00
Sichuan	0.17	0.44	0.01	0.00	0.46	0.00	0.0	0.37	0.00	0.37
Gansu	51.95	35.59	5.66	0.35	41.60	10.35	19.9	26.03	2.00	28.03
Ningxia	91.24	67.40	5.68	0.69	73.77	17.47	19.1	36.88	0.00	36.88
Inner Mongolia	107.09	63.90	16.88	0.03	80.81	26.29	24.5	54.03	0.00	54.03
Shaanxi	78.16	41.65	27.56	0.60	69.81	8.35	10.7	35.04	0.00	35.04
Shanxi	57.19	36.00	21.08	0.00	57.08	0.12	0.2	34.14	5.60	39.74
Henan	54.86	33.33	21.50	0.02	54.86	0.00	0.0	30.36	20.72	51.08
Shandong	22.50	8.14	11.60	0.00	19.74	2.76	12.3	6.50	58.04	64.54
Hebei、Tianjin									18.44	18.44
Total	485.79	302.05	113.22	1.72	416.99	69.09	14.2	236.35	104.81	341.16

4 Water allocation scheme of YRB
4 黄河流域水资源配置

- From the operation of the eastern and middle routes of SNWDP to the operation of western routes of SNWDP
  - the surface runoff will be 51.98 billion m^3
  - water quantity outside river is 33.279 billion m^3; the water volume entering into the sea is 18.7 billion m^3
- 南水北调东中线工程生效后至南水北调西线一期工程生效前
  - 地表径流量为519.79亿m^3
  - 配置河道外各省（区）可利用水量332.79亿m^3，入海水量为187.00亿m^3

Yellow River water allocation after the operation of the eastern and middle routes of SNWDP to the operation of western routes of SNWDP (units: hundred million m^3)

The second grade District Provinces(regions)	Water demand	Water volume of configuration to the basin				Water shortage	Water shortage ratio（%）	Consumptive use of surface water		
		Surface water	Ground water	Other	Total			Inside basin	Outside basin	Total
Upper longyangxia	2.63	2.60	0.12	0.02	2.74	0.00	0.0	2.30	0.00	2.30
From Longyangxia to Lanzhou	48.19	28.99	5.33	1.12	35.43	12.76	26.5	22.28	0.40	22.68
From Lanzhou to Hekouzhen	200.26	135.55	26.40	2.46	164.41	35.86	17.9	96.95	1.60	98.55
From Hekouzhen to Longmen	26.20	14.58	7.48	1.04	23.10	3.10	11.8	11.67	5.60	17.27
From Longmen to Sanmenxia	150.93	80.19	47.00	5.28	132.47	18.47	12.2	67.31	0.00	67.31
From Shanmenxia to Huayuankou	37.72	22.00	13.76	1.47	37.22	0.50	1.3	17.66	8.22	25.88
Underside Huayuankou	49.31	23.37	20.33	0.97	44.67	4.63	9.4	20.34	77.52	97.86
Inner Flow Area	5.88	1.14	3.29	0.08	4.51	1.37	23.3	0.94	0.00	0.94
Qinghai	25.92	15.60	3.26	0.20	19.07	6.85	26.4	13.16	0.00	13.16
Sichuan	0.31	0.42	0.02	0.00	0.44	0.00	0.0	0.37	0.00	0.37
Gansu	59.96	35.49	5.67	2.30	43.47	16.49	27.5	26.37	2.00	28.37
Ningxia	86.40	64.70	7.68	0.89	73.27	13.13	15.2	37.32	0.00	37.32
Inner Mongolia	107.13	63.95	23.76	1.42	89.13	18.00	16.8	54.68	0.00	54.68
Shaanxi	90.30	42.00	28.86	3.59	74.46	15.84	17.5	35.46	0.00	35.46
Shanxi	65.85	41.67	21.11	1.65	64.43	1.42	2.2	34.62	5.60	40.22
Henan	60.65	36.57	21.77	1.57	59.92	0.73	1.2	30.97	20.72	51.69
Shandong	24.62	8.00	11.55	0.80	20.36	4.26	17.3	6.50	58.82	65.32
Hebei、Tianjin									6.20	6.20
Total	521.13	308.41	123.70	12.43	444.54	76.71	14.7	239.45	93.34	332.79

4 Water allocation scheme of YRB
4 黄河流域水资源配置

- After the operation of water transfer project, such as the western route of SNWDP
  - the runoff of Yellow River will be reduced to 51.479 billion m^3, together with the transferred water (9.763 billion m^3) the total runoff of the Yellow River is 61.242 billion m^3
  - 40.105 billion m^3 for outside river and 21.137 billion m^3 for inside river
- 南水北调西线等调水工程生效后
  - 黄河河川径流量将减少到514.79亿m^3，加上调入水量97.63亿m^3，黄河的径流总量为612.42亿m^3
  - 配置河道外401.05亿m^3，入海水量211.37亿m^3

Yellow River water allocation after the operation of water transfer project, such as the first stage western route of SNWDP (units: hundred million m^3)

The second grade District Provinces(regions)	Water demand	water volume of configuration to the basin				The water shortage	The water shortage ratio（%）	Consumptive use of surface water			Consumption use of water outside the basin			total
		surface water	Ground water	Other	total			Inside basin	Outside basin	total	Inside basin	Outside basin	total	
Upper longyangxia	3.39	3.31	0.12	0.03	3.47	0.00	0.0	2.99	0.00	2.99				2.99
From Longyangxia to Lanzhou	50.68	36.72	5.33	1.75	43.80	6.88	13.6	18.99	0.40	19.39	10.50		10.50	29.89
From Lanzhou to Hekouzhen	205.64	167.16	27.38	3.84	198.37	7.26	3.5	98.25	5.60	103.85	31.30	4.00	35.30	139.15
From Hekouzhen to Longmen	32.37	21.96	8.62	1.63	32.21	0.16	0.5	10.91	5.60	16.51	7.50		7.50	24.01
From Longmen to Sanmenxia	158.28	97.75	46.77	8.74	153.25	5.02	3.2	68.86	0.00	68.86	13.70		13.70	82.56
From Shanmenxia to Huayuankou	40.98	23.43	13.57	2.57	39.58	1.40	3.4	19.24	8.22	27.46				27.46
Underside Huayuankou	49.79	23.32	20.20	1.67	45.18	4.60	9.2	19.04	77.52	96.56				96.56
Inner Flow Area	6.19	1.39	3.29	0.12	4.79	1.40	22.6	1.17	0.00	1.17				1.17
Qinghai	27.67	21.35	3.27	0.40	25.01	2.66	9.6	13.16	0.00	13.16	5.00		5.00	18.16
Sichuan	0.36	0.42	0.02	0.00	0.44	0.00	0.0	0.37	0.00	0.37				0.37
Gansu	62.61	43.14	5.68	3.56	52.38	10.23	16.3	26.37	2.00	28.37	8.00	4.00	12.00	40.37
Ningxia	91.16	80.28	7.68	1.34	89.30	1.86	2.0	37.32	0.00	37.32	15.30		15.30	52.62
Inner Mongolia	108.85	78.00	25.08	2.24	105.32	3.53	3.2	54.68	0.00	54.68	15.20		15.20	69.88
Shaanxi	98.09	62.57	29.51	5.68	97.76	0.33	0.3	35.46	0.00	35.46	17.50		17.50	52.96
Shanxi	69.87	43.65	21.06	3.02	67.74	2.13	3.0	34.62	5.60	40.22	2.00		2.00	42.22
Henan	63.26	36.15	21.55	2.78	60.49	2.77	4.4	30.97	20.72	51.69	0.00		0.00	51.69
Shandong	25.48	9.46	11.44	1.33	22.23	3.24	12.7	6.50	58.82	65.32	1.26		1.26	66.58
Hebei、Tianjin									6.20	6.20				6.20
Total	547.33	375.02	125.28	20.36	520.66	26.74	4.9	239.45	93.34	332.79	64.26	4.00	68.26	401.05
Use of water inside river								182.00		182.00	29.37		29.37	211.37
The water quantity of entering into the sea	211.37													

4 Water allocation scheme of YRB
4 黄河流域水资源配置

※ From present to the operation of the eastern and middle routes of SNWDP, water allocated outside river is 34.116 billion m^3 and water entering into the sea is 19.363 billion m^3. The water shortage of Yellow River is 9.546 billion m^3, including 6.909 billion m^3 for outside river and 2.637 billion m^3 for inside river .

现状至南水北调东、中线工程生效前，配置河道外各省（区）水量341.16亿m^3，入海水量193.63亿m^3。黄河流域缺水量为95.46亿m^3，其中河道外缺水69.09亿m^3；河道内缺水26.37亿m^3。

4 Water allocation scheme of YRB
4 黄河流域水资源配置

※ From the operation of the eastern and middle routes of SNWDP to the operation of western routes of SNWDP. The water shortage of Yellow River is 10.971 billion m^3, including 7.671 billion m^3 for outside river and 3.3 billion m^3 for inside river.

南水北调东中线工程生效后至南水北调西线一期工程生效以前，由于需水增加和黄河河川径流量减少，黄河流域缺水量达到109.71亿m^3，其中河道外缺水量76.71亿m^3，河道内缺水量33.00亿m^3。

4 Water allocation scheme of YRB
4 黄河流域水资源配置

※ From the operation for first stage of western route of SNWDP, the water shortage of Yellow River is 2.674 billion m^3 for outside river and 0.863 billion m^3 for inside river .

南水北调西线一期等调水工程生效后，全流域河道外缺水缺水量26.74亿m^3，河道内缺水8.63亿m^3。

4 Water allocation scheme of YRB
4 黄河流域水资源配置

From the operation for first stage of western route of SNWDP, the water transferred to the Yellow River Basin is 9.763 billion m^3, which effectively mitigates the extreme water shortage in the YRB. The consumption of surface water will reach 40.1 billion m^3, and water entering into the sea will amount to 21.1 billion m^3.

南水北调西线一期等调水工程生效后（2030年水平），西线一期工程和引汉济渭等调水工程调入黄河流域97.63亿m^3，有力的缓解了黄河流域极度缺水的矛盾，地表水耗损量达到401亿m^3，入海水量达到211亿m^3。

5 Countermeasures
5 对策措施

- Water-saving, about 7.0 billion m^3
- Inter-basin water transfer
  - 1.5 billion m^3 from Hanjing-to-Weihe Water Diversion Project
  - 8 billion m^3 from the first stage of SNWDP
- Reinforce water resources regulation and management

节水，可节水70亿m^3左右。

跨流域调水，引汉济渭15亿m^3，南水北调西线一期80亿m^3。

加强调度和管理


汇报结束
谢谢！
Thank You