



राष्ट्रीय जल विकास अभिकरण
(जल संसाधन, नदी विकास और गंगा
संरक्षण मंत्रालय, भारत सरकार)

National Water Development Agency
(Ministry of Water Resources, River Development
and Ganga Rejuvenation, Government of India)

**Minutes of the
Eighth Meeting of the Task Force
for Inter-linking of Rivers
(Held on 15th September, 2017 at New Delhi)**

नई दिल्ली
New Delhi

Minutes of the Eighth Meeting of Task Force for Interlinking of Rivers held at New Delhi on 15th September, 2017

Eighth Meeting of Task Force for Interlinking of Rivers was held on 15th September, 2017 at New Delhi under the chairmanship of Shri B. N. Navalawala, Chairman, Task Force & Chief Advisor, Ministry of Water Resources, River Development and Ganga Rejuvenation. List of the participants is enclosed as Annex-I.

At the outset, Chairman, Task Force extended a warm welcome to all the Members, Special Invitees and other participants attending the meeting. The Chairman informed the participants that the tenure of the Task Force has been made co-terminus with the Special Committee on Interlinking of Rivers. Regarding implementation of Ken Betwa link project he expressed the hope that U.P. and M.P. would soon resolve the issue of sharing of water. Thereafter, the Chairman requested Director General, NWDA and Member Secretary, Task Force to take up agenda items for discussion.

Item 8.1: Confirmation of the minutes of the 7th meeting of the Task Force for Interlinking of Rivers held on 11th May, 2017 at New Delhi

Director General, NWDA informed that the minutes of the seventh meeting of the Task Force for Interlinking of Rivers (TF-ILR) held on 11.05.2017 at New Delhi were circulated to all the members vide letter dated 08.06.2017. Since no comments were received from any of the members, the Minutes of the seventh meeting of the Task Force for Inter Linking of Rivers were confirmed as circulated.

Item No.8.2: Follow-up action on the decisions taken during the last meeting

(i) Constitution of the Financial Sub Committee/ Group:

The DG, NWDA informed that the Ministry of Water Resources, RD & GR vide O.M. dated 12.09.2017 has constituted the Group on Financial Aspects under Task Force for ILR (Annex-8.2.1).

The members discussed the TORs of the Financial Group including that related to considering ILR projects as National projects. Shri Jagmohan Gupta, JS & FA (WR, RD & GR) mentioned that initially when 14 important projects of the country, including Ken Betwa link project were declared as National Projects, the funding pattern agreed was 90 (Centre) : 10 (State). However, only one or two out of 14 projects declared as National projects were taken up for implementation earlier and other projects could not taken up because of various reasons. Now the present funding pattern is of 60 (Centre): 40 (State) in view of the fact that State allocation of fund has been increased. Even in case of Ken-Betwa Project, Ministry of Finance is yet to agree to the Ministry's proposal of 90;10 funding pattern. Shri Sanjay Kundu, Joint Secretary (PP) informed the Task Force that PMO had taken meeting on the funding pattern of Ken-Betwa link project and suggested to refer the proposal to PIB for their views. Shri Prodipto Ghosh enquired regarding criteria/ procedure for declaring the project as National Projects. Chairman, Task Force mentioned that since each link project of NPP involved two or more States with some of them

having international implication, in such a situation, almost all the link projects identified by NWDA under NPP are likely to fall under the category of National Projects.

After detailed discussions, the Chairman, TF requested the Chairman of Group on Financial Aspects to evolve criteria for considering the ILR projects as National Projects and suggest the appropriate mechanism to fund the ILR projects. Chairman, Task Force suggested to include JS &FA (MoWR, RD & GR) as Special Invitee for all the meetings of Financial Group.

(ii) Presentation on Groundwater Recharge:

Shri K.C. Naik, Member, Central Ground Water Board and his team made a presentation on the status of ground water availability, ground water draft and ground water recharge with respect to whole country. Copy of presentation is enclosed as Annex- 8.2.2.

Item 8.3: Group on legal aspects under Task Force on Interlinking of Rivers

DG, NWDA informed that as decided by Task Force in its meeting held on 11.05.2017, NWDA vide letter dated 17.07.2017 had sent a copy of the report on Legal Aspects of ILR to Prof. N.R. Madhava Menon, Retired Director, National Law University, Bangalore for his opinion on the findings of the report. Prof. N. R. Madhava Menon vide his e-mail dated 11.08.2017 sent his opinion as under:

- (i) *Presidential Reference to the Supreme Court at this stage of the project is unnecessary as it may make problems complicated and intractable. Firstly, issues which require a judicial finding are neither clear nor specific. Secondly, it is not fair to ask judiciary to suggest way forward on an issue where the politics and economics of the problem dominate policy development.*
- (ii) *Even though, it appears that there is no need for a Constitutional amendment for the Union to act in the matter, it is desirable to invoke the provision of Article 262 by persuading two or more States to seek Parliamentary intervention. At least, it will ease possible legal challenges in the beginning itself thwarting central action.*
- (iii) *The Union Government may also bring out a White Paper on the subject and put it for discussion in the Inter-State Council as well. This will further absorb possible opposition from State Governments establishing bona fides of the Union Government if the matter goes for adjudication.*
- (iv) *There is no doubt that a Parliamentary legislation on the lines of the legislative framework adopted in other federal systems is necessary for facilitating smooth Inter-basin water transfer and for expeditious implementation of the project. It is important that the law is carefully drafted and broadly articulated with a built-in dispute resolution mechanism comparable to the National Green Tribunal as part of the Law. National Water Dispute Tribunal may not have time and expertise to handle efficiently Inter-basin water disputes, some of which may have international ramifications.*

- (v) *A working group of international law experts should look into possible legal issues which may be taken up before international forums by stakeholders outside India, once the project is finalised for implementation. I am in agreement with Task Forces suggestion that the international legal issues which may crop up once the Himalayan links are taken up as part of the project maybe given priority attention.*

Regarding Presidential reference, Members of the Task Force agreed with the views of Dr. Madhava Menon. Regarding review of Tribunal awards, Shri Mohile expressed the view as to how tribunal can give perpetual award like Godavari award which can not be reviewed. KWDT and NWDT awards have provisions of review. Joint Secretary (PP), Ministry of WR, RD & GR mentioned that the Ministry had taken stand that the Tribunal awards can not be reviewed and accordingly affidavit/ counter affidavit was filed in the Hon'ble Supreme Court. Shri Mohile mentioned that unless and until the Godavari award was reviewed, the feasibility of Peninsular links was doubtful as the planning of Peninsular links was based on the assumption that Mahanadi and Godavari rivers were having surplus water. Shri Sriram Vedire, Adviser, Ministry of WR, RD & GR mentioned that Andhra Pradesh was not in a position to use the Godavari water in their territory. Joint Secretary (PP), MoWR, RD & GR was of the view that only Brahmaputra water should be taken to Peninsular links. It was clarified that Brahmaputra water can reach upto Godavari through Mahanadi- Godavari link but it may not be possible to take it beyond Godavari unless substitution of water takes place through Godavari.

Shri Mohile emphasized the need for bringing legislation for implementation of ILR Projects. He mentioned that it may not be possible in next five years but it should be pursued continuously and even if such legislation is possible in next 20 years, it would be for betterment of water sector. Some of the members had apprehensions that if some legislation is enacted, that may cause adverse reaction among States. They cited example of Sutlej-Yamuna link canal where work is not being executed inspite of directions of Hon'ble Supreme Court.

After detailed discussion it was decided that a white paper/ status paper on implementation of ILR programme should be brought out by NWDA and put up to the Task Force for consideration.

Item 8.4: System Simulation Studies of Mahanadi-Godavari link

The DG, NWDA informed that NIH Roorkee has revised the hydrological studies and multi-reservoir simulation for the proposed Mahanadi-Godavari link considering the observations of Odisha and the suggestion of the Sub-Committee for System Studies and submitted to NWDA. This report was again considered by the Sub Committee for System Studies in the tenth meeting held on 03.03.2017 and the report was accepted. After approval of the study, Govt. of Odisha has sent certain observations on the report which are being examined by NWDA.

Item 8.5: Manas - Sankosh – Teesta - Ganga (MSTG) Link:

Latest status on MSTG link has been discussed in Item No. 8.7 (International issues associated with Himalayan links).

Item 8.6: Funding of ILR Projects as proposed in Action Plan-II of earlier Task Force

As mentioned in Para 8.2 (i), proposal for constituting “Group on Financial Aspects” under Task Force for Interlinking of Rivers, headed by Dr. Pradipto Ghosh, Former Secretary to the Govt. of India and Member of the Task Force has been approved by the Ministry of WR, RD & GR vied O.M. dated 12.09.2017. As per terms of reference the Group would look into the financial aspects of various inter-basin water transfer links identified by NWDA and suggest funding pattern for implementation of these links.

Item 8.7: International issues associated with Himalayan Links

Status on international issues associated with Himalayan links, as given in the agenda note was noted by the Members of the Task Force. Based on white paper as mentioned above, further action would be taken.

Item 8.8: Any other Item with the permission of the Chair.

With the permission of the chairman, Task Force, following item was brought for discussion in the meeting:

“Review of NWDA guidelines for carrying out Water Balance Study in a River Basin”

The DG, NWDA informed that the Guidelines of NWDA for carrying out water balance studies in a river basin were discussed by the Task Force in its 6th meeting held on 13.02.2017 and suggested minor modifications. These Guidelines have been modified duly considering the suggestions of the Task Force. A presentation was made on the modified Guidelines during the meeting. After discussion, the Task Force approved the NWDA Guidelines for carrying out Water Balance Study in a River Basin. The approved Guidelines are attached as Annex-8.8.1.

Meeting ended with vote of thanks to the chair.

List of Participants of the Eighth Meeting of the Task Force for Interlinking of Rivers held on 15.09.2017 at New Delhi.

- | | | |
|----|---|------------------|
| 1. | Shri B.N. Navalawala,
Chief Advisor, Ministry of WR, RD & GR | Chairman |
| 2. | Shri A.D. Mohile,
Former Chairman, CWC | Member |
| 3. | Shri Sriram Vedire,
Adviser, Ministry of WR, RD & GR | Member |
| 4. | Shri Prodipto Ghosh,
Former Secretary, MoEF | Member |
| 5. | Shri Jagmohan Gupta,
JS&FA, Ministry of WR, RD&GR | Member |
| 6. | Shri S. Masood Husain,
Director General, NWDA | Member-Secretary |

Special Invitee

7. Dr. Sanjay Kundu,
JS (PP), Ministry of WR, RD & GR
8. Shri K. C. Naik,
Member, CGWB

Officers from MoWR, RD & GR & Other Departments

9. Shri Virendra Sharma,
Sr. JC (BM), Ministry of WR, RD & GR
10. Shri S.K. Sinha,
Scientist 'D', CGWB

NWDA Officers

11. Shri R.K. Jain,
Chief Engineer (HQ)
12. Shri K.P. Gupta,
Director (Technical/SCILR)
13. Shri Anil Kumar Jain ,
Deputy Director (SCILR)
14. Shri M. K. Sinha,
Senior Consultant

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To:

P.1

F.No.2/5/2005-BM /1033-48
 Government of India
 Ministry of Water Resources, River Development
 and Ganga Rejuvenation
 BM Section

Block No. 3, 2nd Floor, CGO Complex, Lodhi Road,
 New Delhi.

Dated 12.9.2017

OFFICE MEMORANDUM

Subject: Constitution of a Group on Financial Aspects under Task Force for Interlinking of Rivers .

Minister of Water Resources, River Development and Ganga Rejuvenation (MoWR, RD&GR), hereby constitute a Group on Financial Aspects under Task Force for Interlinking of Rivers, with the approval of Competent Authority, to consider the financial aspects of Interlinking of Rivers Project and to suggest the funding pattern for implanting the same.

The composition and terms of reference (ToR) of the said Group is given below:

Composition:

1.	Dr. Prodipto Ghosh, Former Secretary to Govt. of India, and Member of Task Force for ILR		Chairman
2.	Shri A.B. Pandya, Former Chairman, CWC, New Delhi	-	Member
3.	Shri Rana Kapoor, Managing Director & CEO Yes Bank Ltd 9 th Floor, Nehru Centre, Worli, Mumbai	-	Member
4.	Shri Dhiraj Nayyar, OSD (Economics, Finance & Commerce Cell), NITI Ayog, Parliament Street, New Delhi	-	Member
5.	Shri M.K. Mittal, Director (Finance) NHPC, NHPC Complex, Sector-33, Faridabad	-	Member
6.	Shri H. Satish Rao, Retired Director, ADB, Bangalore		Member
7.	Chief Engineer (IMO), CWC, Sewa Bhawan, R.K. Puram, New Delhi		Member
8.	Chief Engineer (HQ), NWDA, New Delhi		Member
9.	Shri K. P. Gupta, Director (Tech), NWDA, New Delhi	-	Member Secretary

Terms of Reference:

- i. to study the documents related with funding of ILR projects prepared by the earlier Task Force on ILR set up by the Government of India in the year 2002.
- ii. to suggest funding mechanism for each link project.
- iii. to study the option(s) of declaring some of the IBWT links of NPP as 'National Project' on the pattern of Ken-Belwa link.

Link India or water

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To:

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- iv to study Sharing of cost of link projects by respective beneficiary States and suggest the basis/formula to determine the cost sharing and
- v any other matter relevant to the above aspects.

Other terms and conditions:

- I. the Group will meet as and when required and submit its report within a period of four months from the date of constitution of the committee, and
- II. NWDA will provide Secretarial and other assistance to the Group

Sitting Fee TA/DA

- i. Sitting fee @ Rs. 4000 per day of sitting to non-official members subject to in no case, the ceiling should exceed 10 meetings in a month as per M/o Finance's OM no. 19047/10/2016-E-IV dated 12.04.2017.
- ii. Payment of Travelling Allowance at the same rates as were admissible to non-official Members at the time of retirement from Government Service, if they have retired from the Central Government. If otherwise, TA entitlement may be regulated as admissible to a Govt. official drawing Grade pay of Rs. 6600/- p.m. as per M/o Finance's OM no. 19030/3/2008-E-IV dated 23.09.2008

The expenditure of the said Groups will be met from the head of Special Cell/Committees on Interlinking of Rivers provided to NWDA under the scheme IWRDS (NWDA component) of River Basin Management Plan Scheme

This issues with the approval of IFD vide its Dy. no. 143/IFD/2017 dated 08.09.2017.

M. J. Upadhyay 12/09/17
(Mannu Ji Upadhyay)
Dy. Commissioner (BM)
Tel: 011-24367129

To

Chairman & Members of the Sub-Committees (As per list attached).

Copy for information to:

- 1. PS to M (WR).
- 2. PPS to Secretary (WR, RD & GR)
- 3. PS to Joint Secretary (PP)/JS & FA, MoWR, RD & GR
- 4. PS to Chairman, Task Force ILR, Room No. 428-B, SS Bhawan, New Delhi.
- 5. Director General, NWDA
- 6. PAO, MoWR, RD & GR.

task force is member

SEP-14-2017 12:52 From:

To:

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List of Addressee

1. Dr. Prodipto Ghosh, Former Secretary to Govt. of India, and Member of Task Force for ILR
2. Shri A.B. Pandya, Former Chairman, CWC, New Delhi
3. Shri Rana Kapoor, Managing Director & CEO, Yes Bank Ltd 9th Floor, Nehru Centre, Worli, Mumbai
4. Shri Dhiraj Nayyar, OSD (Economics, Finance & Commerce Cell), NITI Ayog, Parliament Street, New Delhi
5. Shri M.K. Mittal, Director (Finance) NHPC, NHPC Complex, Sector-33, Faridabad.
6. Shri H. Satish Rao, Retired Director, ADB, Bangalore
7. Chief Engineer (IMO), CWC, Sewa Bhawan, R.K. Puram, New Delhi.
8. Chief Engineer (HQ), NWDA, New Delhi.
9. Shri K. P. Gupta, Director (Tech), NWDA & Member Secretary of Group, New Delhi.

Annex -= 8.2.2

India's Ground Water Resources

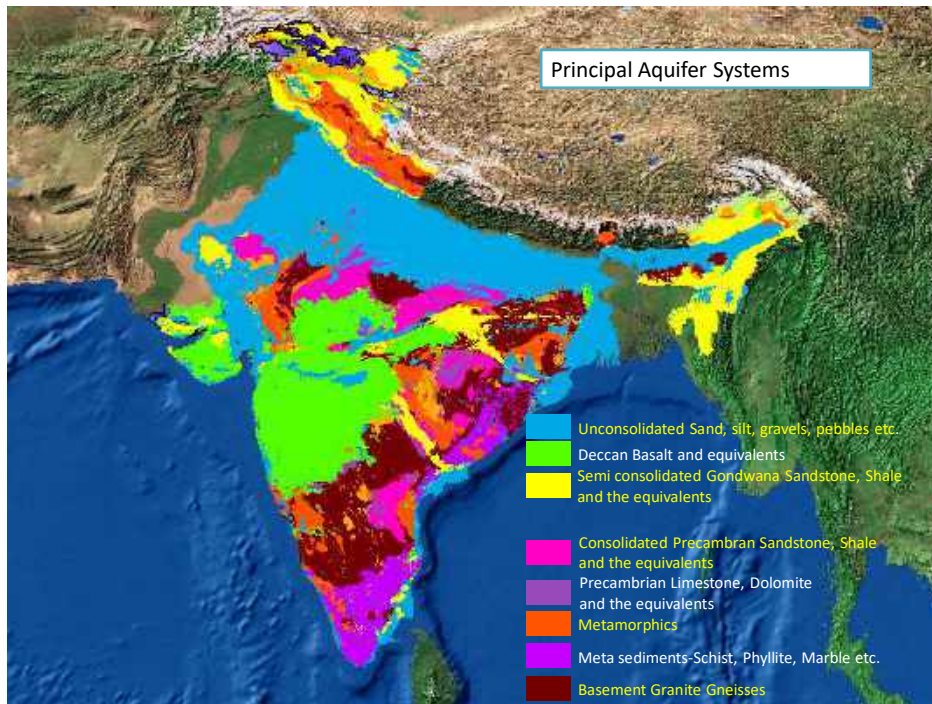


**Central Ground Water Board
Ministry of WR, RD & GR**

Water Availability / Demand India

Availability (BCM)	Demand (BCM)
<ul style="list-style-type: none"> • Total precipitation : 4000 • Total availability : 1869 • Total utilizable water : 1101 • Surface water : 690 • Ground water : 413 	<ul style="list-style-type: none"> • In 2010 : 710 • In 2025 : 843 • In 2050 : 1180 <p style="font-size: small; margin-top: 10px;">Source : National Commission for Integrated Water Resource Development Plan</p>

Land Resources <small>(Source: Annual Report 2015-16 by CWC)</small>	
Total Cultivable Land	182.2
Gross Sown Area (2011-12)	195.2
Net Sown Area (2011-12)	140.8
Irrigation Potential Created (up to March 2012)	113.5
Gross Irrigated Area (2011-12)	91.5
Net Irrigated Area (2011-12)	65.3
<i>Source: Annual Report 2015-16 by CWC</i>	

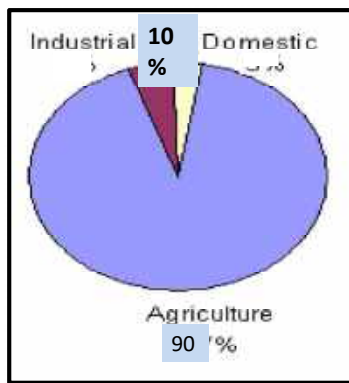


Ground water Recharge from Other Sources (Surface Irrigation)

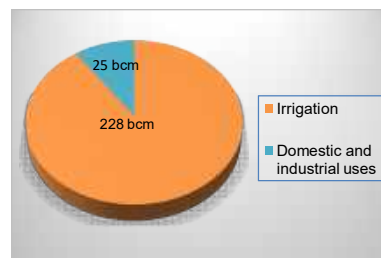
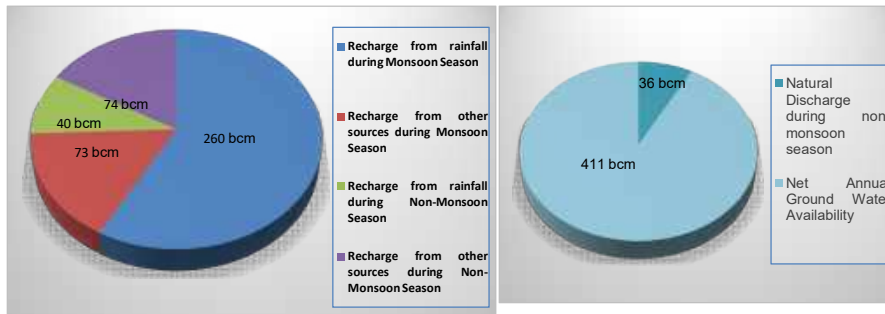
Replenishable Ground Water Resources

•Central Ground Water Board (CGWB) and State Ground Water Organizations jointly assess the ground water resources of the country periodically on the basis GEC-97 Methodology.

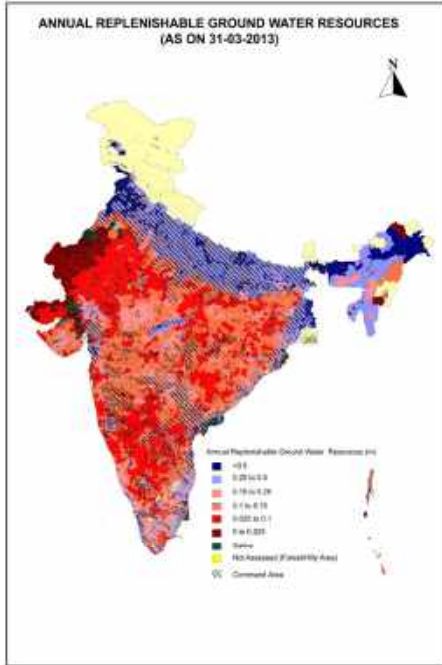
•As per the latest ground water resources assessment of the country (As on 2013):



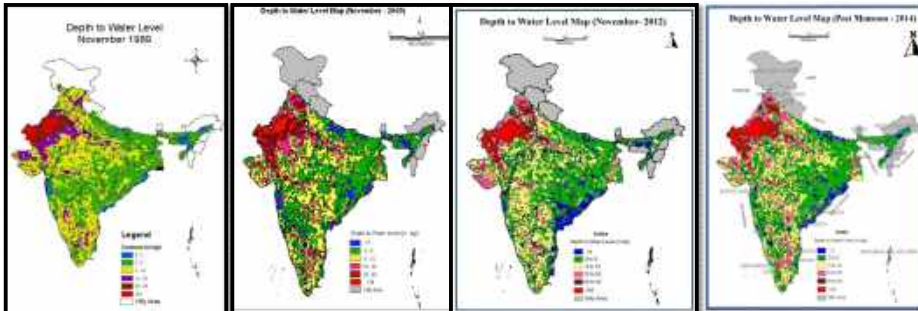
1	Annual Replenishable Resource	447 bcm
2	Net Annual Availability	411 bcm
3	Total Annual Draft (bcm) - Irrigation - Domestic & Industrial -	253.06 228.30 (90%) 24.76 (10%)
4	Stage of Ground Water Development	62%



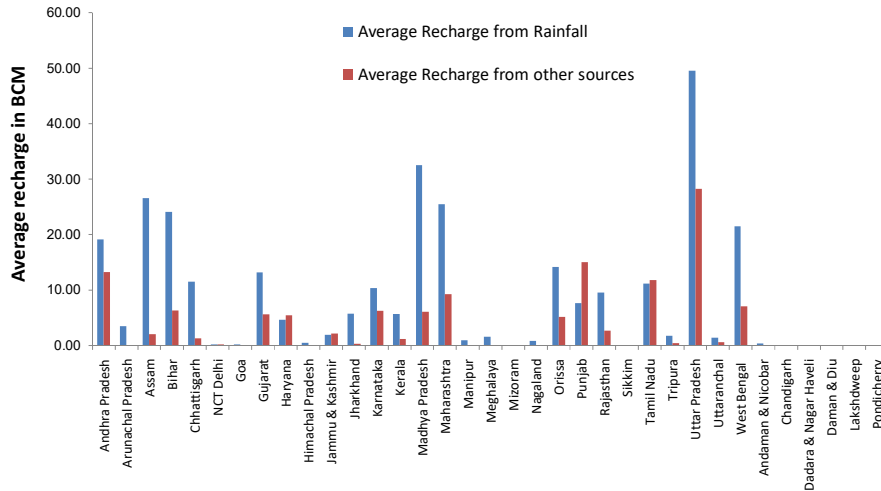
Ground Water Resources Availability and Utilization in India (2013)



GW Recharge in Irrigation Command Areas



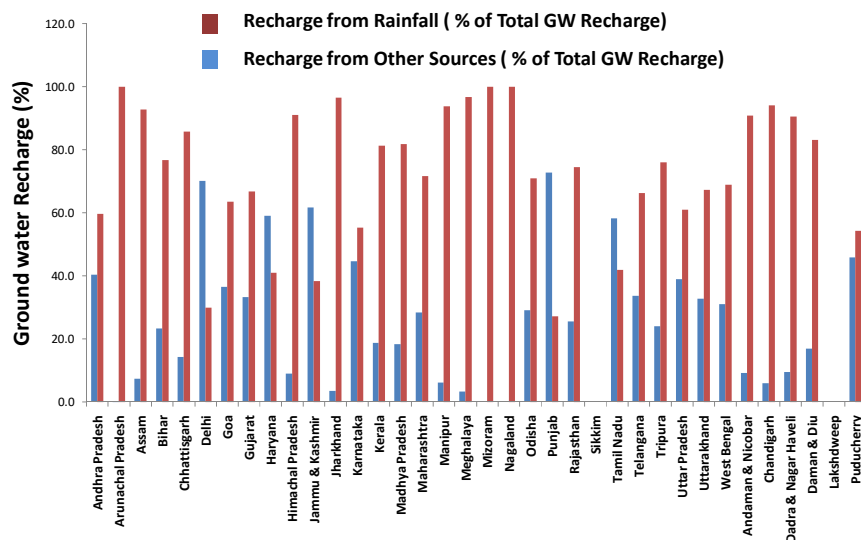
Maps showing Depth to water level



Recharge from rainfall vis-a-vis Recharge from other sources

Variation of Recharge from rainfall and Other Sources

Year	Rainfall Recharge		Recharge from Other sources		In BCM Total
	Monsoon	Non Mon	Monsoon	Non Mon	
1995					
2004	248.01	41.85	69.59	73.19	432.64
2009	246.45	45.71	67.38	71.48	431.02
2011	252.53	40.63	69.06	70.48	432.7
2013	259.33	40.53	72.00	74.28	446.14

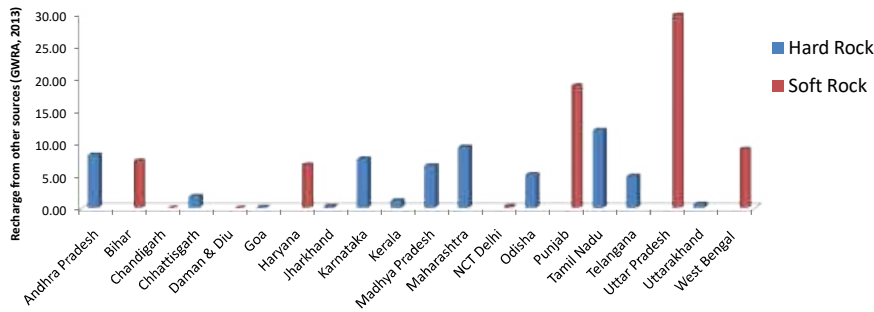


Recharge from rainfall vis-a vis Recharge from other sources

GW Recharge from Surface Irrigation

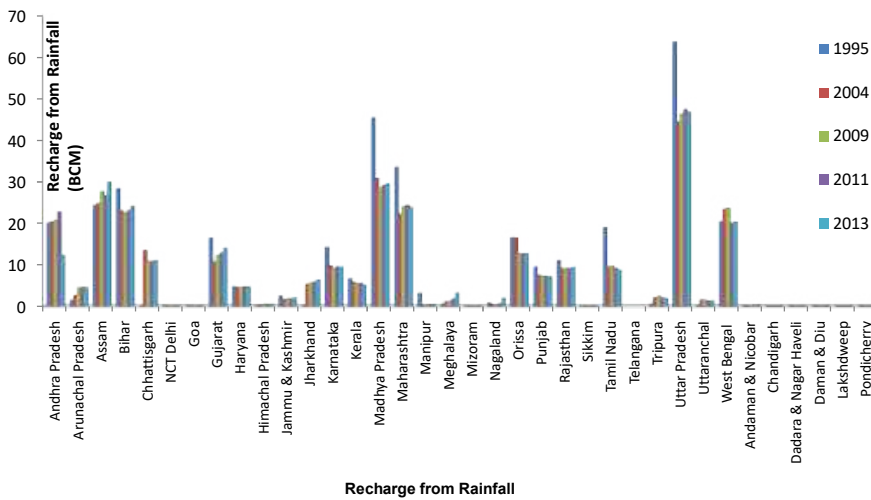
States where the GW Recharge from Other sources (viz. Seepage from canal, Return Seepage from Surface Irrigation, Recharge from tanks and Ponds etc.) is $\geq 40\%$ of the Total Annual replenishable GW recharge.

Name of State	GW Recharge from Other Sources (% of Total Recharge)
Punjab	72.7
Delhi	70.1
Jammu & Kashmir	61.7
Haryana	59.1
Tamil Nadu	58.2
Karnataka	44.6
Andhra Pradesh	40.3
Uttar Pradesh	39



Recharge from other sources in predominantly Hard rock and Soft rock States, GWRA 2013

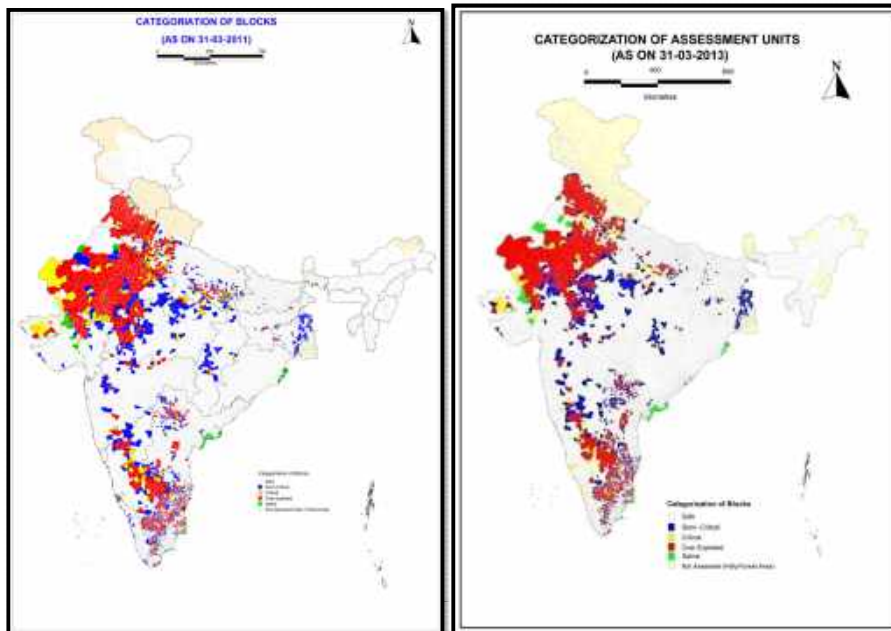
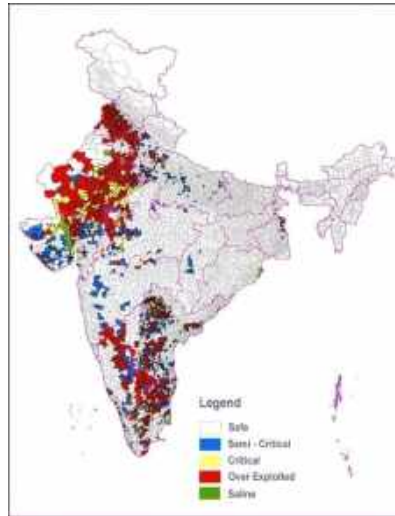
- Ground water recharge from sources other than rainfall is predominant in States occupied by Soft rocks like alluvium.
- Other sources for recharge include Return flow from surface water irrigation, Ground water irrigation, Tanks, ponds etc.
- The average potential of recharge is more in soft rock areas (i.e Punjab, Haryana, Bihar)
- In hard rock states (Andhra Pradesh, Karnataka, MP, Maharashtra) recharge is relatively low given the fact that these states have quite large geographical areas .



Recharge from Rainfall

GW Development Status

- GW exploitation is highly uneven and shows considerable variations from place to place.
- GW development is high (>100%) in the states of Delhi, Haryana, Punjab and Rajasthan and UT of Daman & Diu and Pondicherry.
 - Implies that in these areas the average annual GW withdrawal is more than average annual GW recharge.
- In the states of Gujarat, Karnataka, Tamil Nadu and Uttar Pradesh the average stage of GW development is 70% and above.
- In rest of the states / UTs the stage of ground water development is below 70%.

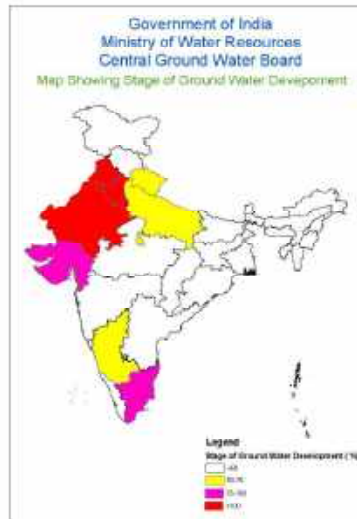


Categorization of Blocks / Mandals/Firkka Talukas 2011	
Assessed units	6607
Over-Exploited	1071
Critical	217
Semi-Critical	697
Safe	4530
Saline	92

Categorization of Blocks / Mandals/Firkka Talukas 2013	
Assessed units	6584
Over-Exploited	1034
Critical	253
Semi-Critical	681
Safe	4520
Saline	96

Ground Water Development Scenario – A Glimpse

- Delhi, Haryana, Punjab, Rajasthan, UT of Daman & Diu & Pondicherry >100%
- Gujarat, Tamil Nadu 75-100%
- Karnataka, Uttaranchal, U.P., Lakshadweep 50 - 75%
- Rest of India < 50%

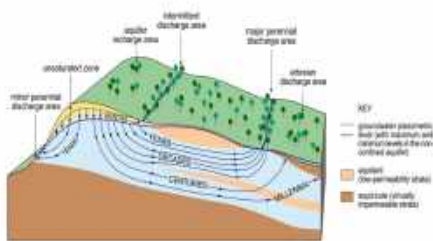


GROUND WATER MANAGEMENT UNIT
(AQUIFER VS WATESHED)

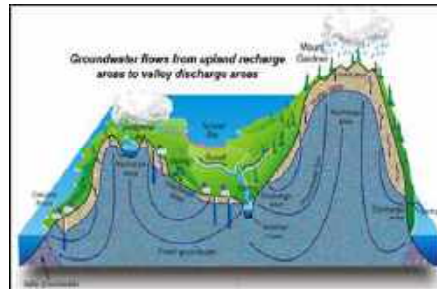
AQUIFER	WATESHED
Is a natural hydrogeological unit	May not necessarily be an independent hydrogeological unit
May be considered to be a unit of uniform ground water potential and characteristics	A watershed may comprise many geological formations with different hydrogeological properties

At times watershed management or catchment treatments may lead to situation

- Increase in the surface water flow.
- Decreased infiltration and natural recharge to groundwater
- Dried up springs and ground water sources.

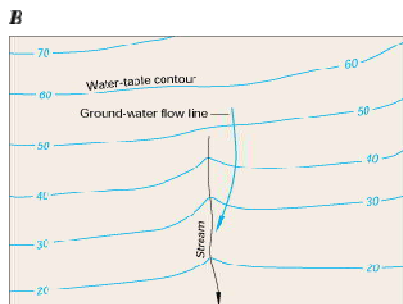


many aquifers have large residence times despite relatively high recharge rates

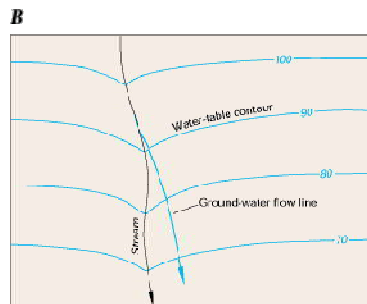


SW & GW Interactions continues.....

Gaining streams receive water from the ground-water system (A). This can be determined from water-table contour maps because the contour lines point in the upstream direction where they cross the stream (B)



Losing streams lose water to the ground-water system (A). This can be determined from water-table contour maps because the contour lines point in the downstream direction where they cross the stream (B).



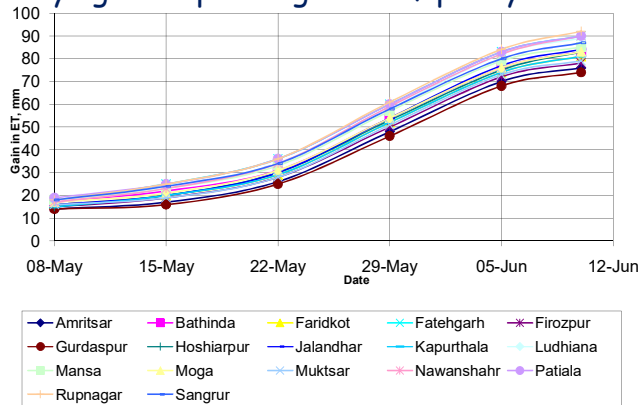
GW Management – Major Issues

- **Regional Imbalances in the Availability & Utilization of Ground Water**
 - Over-exploitation of ground water resources in north-western India
 - Under-Utilization of Ground Water Resources in Eastern sector
 - Vagaries of Monsoon and High Dependence on Ground Water in Western Arid Regions
 - Site-specific Availability of Ground Water in Hard Rock Areas in Peninsular India
 - Limited GW prospects in Hilly Area
 - Water Logging and Salinity Problems in Canal Command Area
- **Energization and Pricing Policy in Irrigation Sector**
- **Ownership and Sectoral Allocation of Ground Water**
- **Impact of Climate Change on Ground Water Resources**

GW Management – Major Concerns

- Non Integrated approach of Management of water resources focussing either on surface water or ground water as if they were separate entities.
- Interconnections of GW and SW is fundamental to development of effective water-resource management and policy.
- SW is hydraulically connected to GW, but the interactions are difficult to observe.
- Aquifer boundaries may or may not coincide with the water shed boundaries as it also depends on the subsurface topography and lithology.
- GW flow directions, may not coincide with that of SW.

Innovative Policy: The Punjab Preservation of Sub-Soil Water Act (2009): ET gains by delaying transplanting date of paddy



ET demand reduced by 1.8, 2.4, 3.5, 6.1, 8.6 and 9.3% through shifting of transplanting dates by 1 to 6 weeks.

Saving in GW draft: 7.2%; Total pumping hours saved: 31 M/ 175 M KWh



Thanks

Milieu

- Ground water has a major role in the economic development of the country & in ensuring its food security.
- Use of ground water has increased substantially over the last few decades.
- Increasing demands of ground water and its decreasing availability is becoming a major challenge.

Irrigation potential created has increased from 6.5 mha in 1950 to ~70 mha at present

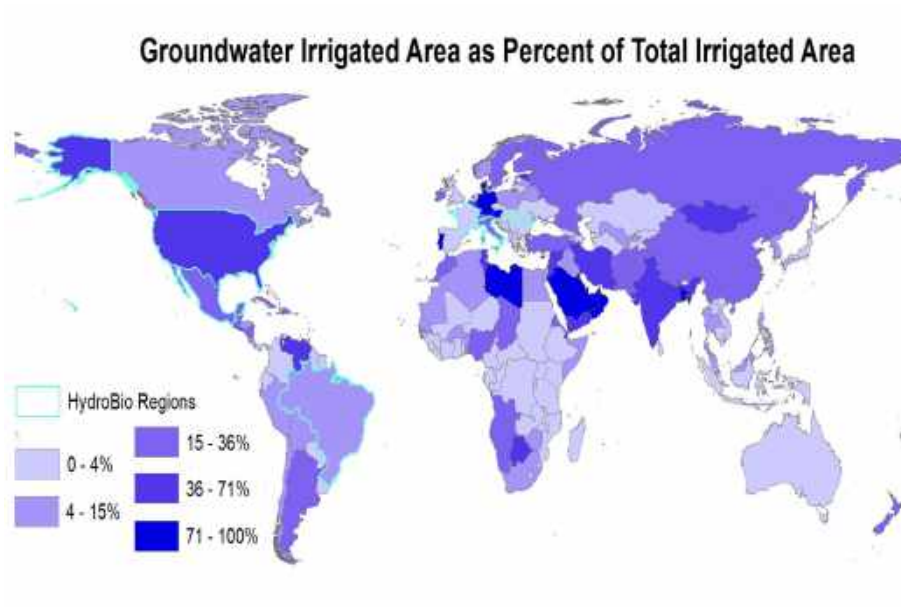


Area under GW irrigation has increased from 30 to 60% of the Total area irrigated during 1956-2006

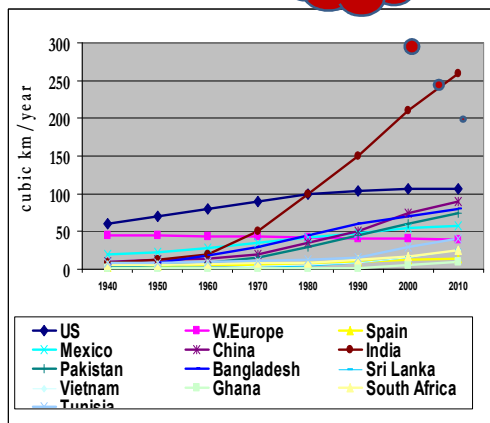


Ground Water is the Key Element for Achieving National Water Security:

- Household Water Security
- Economic Water Security
- Urban Water Security
- Environmental Water Security
- Resilience to Water Related Disasters



India is the world's largest user of groundwater in agriculture in the world.



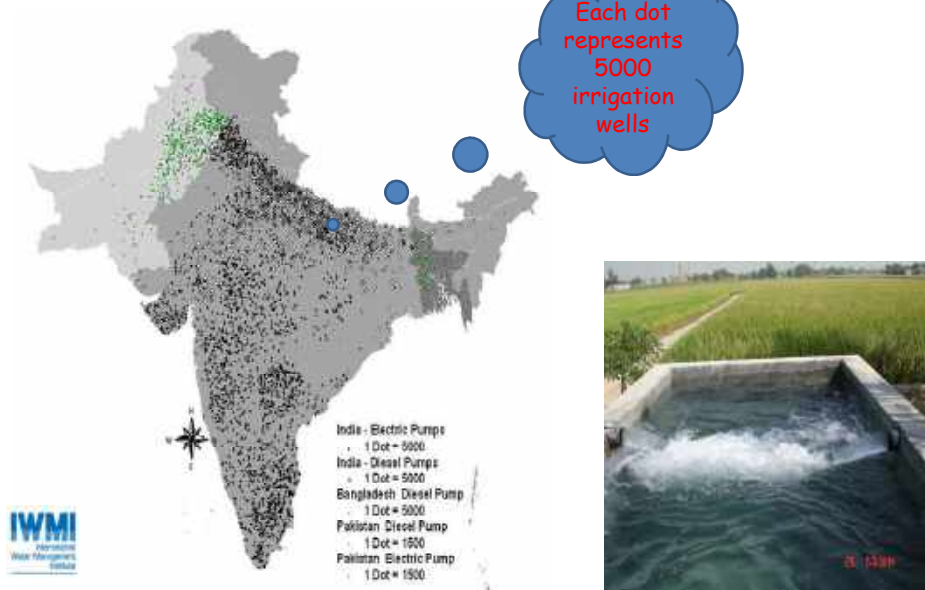
India has over 20 million irrigation wells. Until 2000, it added 0.8 million/year.

Every fourth cultivator owns an irrigation well; non-owners depend on groundwater markets.

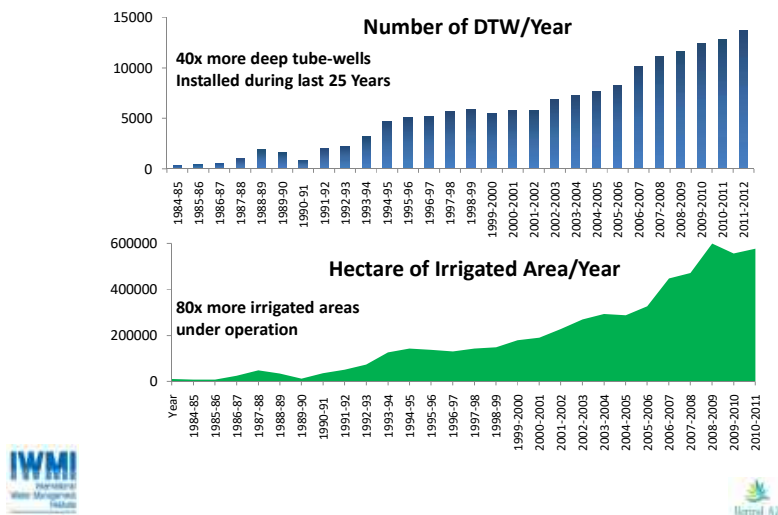
Increasing irrigation in canal and tank commands is with Pumped water

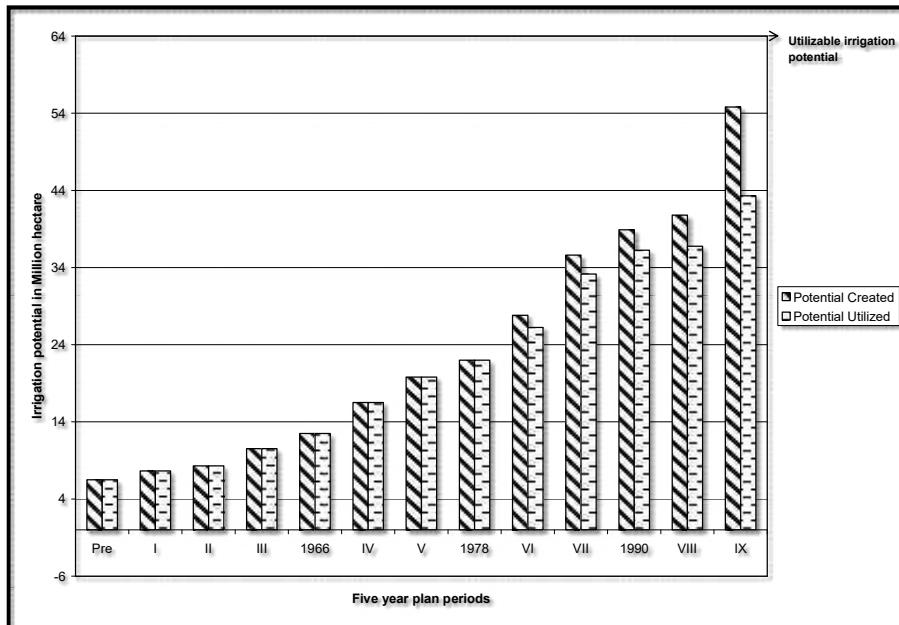
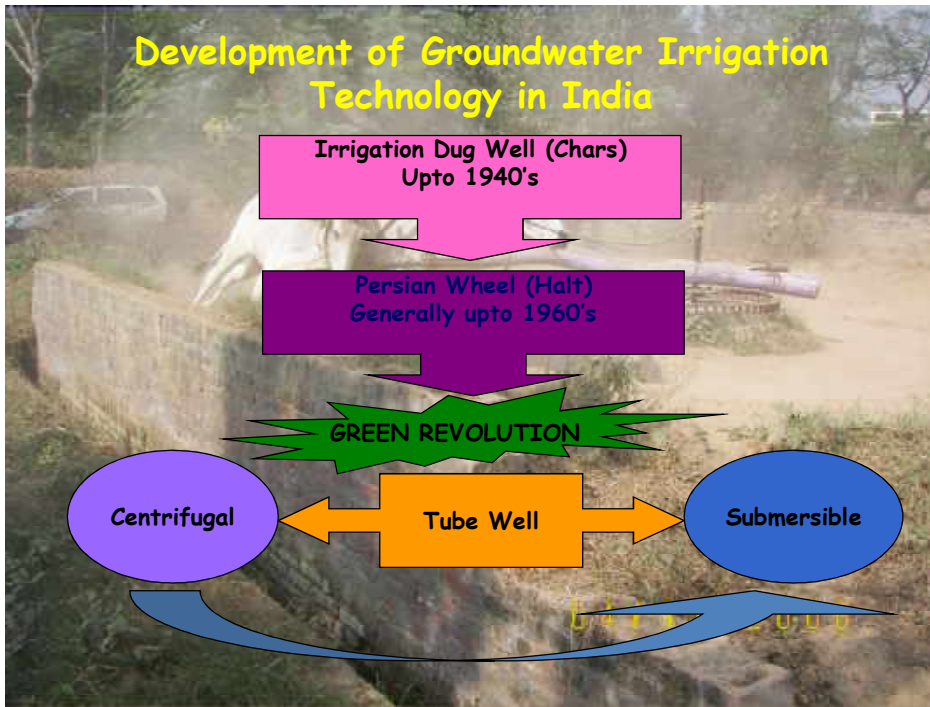


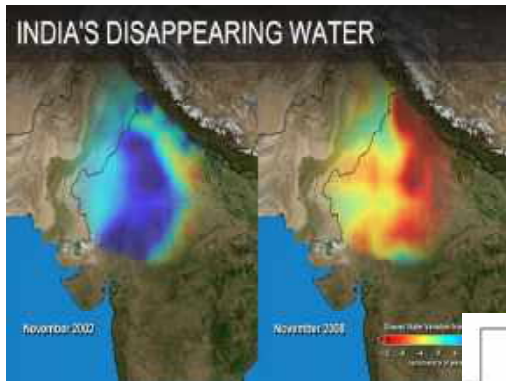
Rise of a Water Scavenging Irrigation Economy



Year wise Deep Tube Well Operation & Irrigated Areas

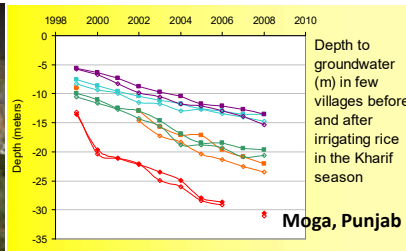




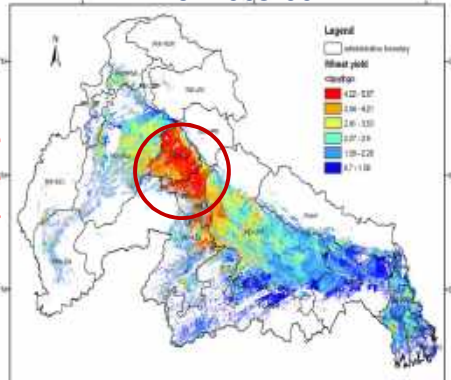


Source : GRACE Satellite, NASA

This is about 7 per cent of the basin area which produces the most food for the vast population and is under serious hydrological threat.



Wheat yield map in IG basin for 2005-06



Aquifer Systems/Watersheds



Stage of Ground Water Development of India :2011 & 2013

Sl. No.	States / Union Territories	Stage of Ground Water Development (%) 2011	Stage of Ground Water Development (%) 2013
	States		
1	Andhra Pradesh	37	44
2	Arunachal Pradesh	0.08	0.23
3	Assam	14	16
4	Bihar	44	45
5	Chhattisgarh	35	37
6	Delhi	137	127
7	Goa	28	37
8	Gujarat	67	68
9	Haryana	133	135
10	Himachal Pradesh	71	51
11	Jammu & Kashmir	21	24
12	Jharkhand	32	23
13	Karnataka	64	66
14	Kerala	47	47
15	Madhya Pradesh	57	57
16	Maharashtra	53	54
17	Manipur	1.02	1.01
18	Meghalaya	0.08	0.4

Stage of Ground Water Development of India :2011 & 2013 Contd...

Sl. No.	States / Union Territories	Stage of Ground Water Development (%) 2011	Stage of Ground Water Development (%) 2013
	States		
19	Mizoram	3.52	2.9
20	Nagaland	6.13	2.0
21	Odisha	28	30
22	Punjab	172	149
23	Rajasthan	137	140
24	Sikkim	26	-
25	Tamil Nadu	77	77
26	Telangana	55	58
27	Tripura	7	7.3
28	Uttar Pradesh	74	74
29	Uttarakhand	57	50
30	West Bengal	40	45

**Guidelines for working out Water Balance in a river basin
finalized by the Task Force for ILR after deliberation in its 8th
meeting**

Chapter 2

Basin and Sub-basin

- 1 If the variation in catchment area of any basin/ sub-basin between NWDA and State Govts. figures is within 5% there is no need to revise the figures.

Chapter 3

I Soils, Land Use, Delta and Water use

- 1 The present practice of obtaining land use data of the basins from the land use statistics collected by the Directorate of Economics and Agriculture Statistics of various States may be continued by the NWDA.
- 2 It was agreed that in case of such future projects for which project reports have already been approved by CWC, the cropping pattern as given therein should be considered and for other future projects cropping pattern will be based on the availability of water and agro-climate zone.
- 3 Fodder crops should be included in the cropping patterns recommended by the NWDA in the water balance studies.
- 4 The culturable command area (CCA) need not be projected to 2025 AD/2050 AD and it would be adequate to consider the maximum culturable area of recent five years.
- 5 The permanent pastures and other grazing land need not be included in the culturable area of the basins / sub-basins and no separate provision would be necessary for irrigating the permanent pastures and other grazing lands.

Chapter 5

Water Availability

Computation of Yield

- 1 The yield studies carried by using the rainfall-runoff correlations taking monsoon months as a whole would be continued.

- 2 In case where there is no G&D site or the existing G&D sites cover only a small portion of the catchments, rainfall-runoff relationship obtained for the adjoining hydro-meteorologically similar basin/ sub-basin may be adopted.
- 3 Regeneration from upstream utilisation of both in-basin and imported waters should be considered in the assessment of virgin yields.
- 4 The surface water yield need not be worked out at the state boundaries. The existing procedure for deciding the best-fit equations on the basis of the minimum standard error of estimate might continue.
- 5 Hydrological studies may be updated after a period of 10 years when additional data will be available.
- 6 Though the computer programmes of all the alternative methods have been developed but for water balance studies linear/non-linear type of correlation could continue.
- 7 Import/Export: - While updating the water balance studies export/import of one sub-basin may be compared with the figures for corresponding basin/ sub- basins. Unallocated export/import may be reconciled. The hydrological checks as above may be made for the import/ export figures also.

Water Availability

- 1 The water balance study may project water availability at both 75% and 50% dependability. However, the proposed schemes should provide for a 75% success rate.
- 2 The water balance study should consider the surface water resources only while estimating the water balance in a river basin/sub-basin
- 3 Water availability upto the project site to be checked on the basis of the following:
 - I. Flow series are based on observed data and corrected for existing utilization.
 - II. Extended flow series are based on rainfall-runoff correlations for the project site.
 - III. Extended flow series based on rainfall-runoff correlations for the nearest hydro-meteorologically similar watershed.
 - IV. Prorata Basis

- 50% and 75% yield computed as above may further be adjusted for the ultimate utilizations upstream, exports and imports to compute 50% and 75% dependable availability.
- Water utilizations for any project should be restricted to a maximum of 75% dependable availability in case of diversions. However, for storage projects requirement may exceed 75% dependable availability with provisions of carryover storage.
- Suitability of dam site: This aspect may be accepted as per the information provided by the State Governments/Master Plan.

Ground Water

- 1 The NWDA studies may consider surface water resource only while estimating water balance. The groundwater potential may not be considered as an available resource for the water balance studies being done by NWDA. However, conjunctive use of surface and ground water can be planned while preparing DPR of Water Resources Projects.
- 2 The NWDA studies may consider the gross groundwater potential of the basin/ sub-basin assessed from the statistics supplied by the CGWB/State Groundwater Boards (SGWB).

Chapter 6

Water Requirements

Domestic and industrial water requirement

- 1 The 50% of the rural water requirement and entire livestock water requirement is proposed to be met from groundwater sources. The urban water requirement in full and 50% of the rural water requirement is to be met from surface water sources.
- 2 Entire industrial water requirement is to be met from surface water sources.
- 3 The per capita water requirements @ 135 lts. and 70 lts. for urban and rural population may be adopted in the NWDA studies with 80% of the water returning back to the system.
- 4 In order to update the water balance studies it was decided that while revising the studies population projections may be made upto 2050 AD as per latest revision of UN publication "world population prospectus" on medium variant growth rate.

Salinity Control

- 1 A lump sum provision of 10% of the 75% dependable yield will be earmarked for salinity control tentatively pending detailed studies in this area.

Water releases in the river for environment and ecology

- 1 Regarding how much quantity of water to be released in the river for environment and ecology, it was decided that this issue may be finalized through an expert committee or by the Ministry of Environment and Forests.
- 2 After meeting downstream requirements a minimum lean season flow of 10% of the inflow at diversion structures should be maintained for environmental and ecological purposes with storages. This could be of the order of 10% of the average lean season natural flow downstream of the storage.

Annual Irrigation

- 1 The intensity of irrigation in the case of existing and ongoing projects will be as per the present use. Under Peninsular river development component for the future projects, the intensity may be based on recommended cropping pattern considering the agro-climatic zone and available water at 75% dependable flow. However maximum intensity of irrigation may be restricted to 150% for major projects, 125% for medium projects and 100% for minor projects. The studies should also consider possibility of augmentation in the existing storages to increase the present intensity of irrigation, wherever this is less than the percentages indicated above for the future projects.
- 2 Any surplus surface water for transfer should be assessed only after considering the water needs of the basin for extending irrigation to atleast 60% of net culturable area.

Area to be Brought under Irrigation by 2050 AD

1. In case of deficit basins/sub-basins, where the percentage of existing irrigation from surface water is around 30% of the culturable area, the NWDA may consider extending irrigation facilities to 60% of the culturable area and the additional area to be brought under irrigation would be for a single dry crop without considering any high water consuming crop like sugarcane and paddy.

- 2 The command area of each proposed project may be examined with regard to availability of culturable area overlap with other projects etc. at the time of updating the water balance studies.

Irrigation Water Requirement

- 1 The water requirement for irrigation should be worked out on climatological approach and reasonable provisions made for the field and transmission losses as well as evaporation from the storages.
- 2 In case of future studies irrigation efficiencies of 65% for major and medium projects with a regeneration value of 20% and irrigation efficiency of 80% for minor projects without considering any regeneration shall be considered while working out GIR.
- 3 The evaporation losses may be based on the available data for the existing major and medium reservoirs in and around the basin. Any figure for evaporation losses which is accepted in Tribunal Awards or agreements between the states may be taken for the NWDA studies for the concerned basin/ sub-basin.
- 4 The reservoir evaporation losses may be worked out based on the pan-evaporation data available in the vicinity. However, in the absence of actual data, 20% of the withdrawals from the reservoir may be considered as evaporation losses.
- 5 While presenting the requirements of projects located within sub-basins and basins, the allocations indicated by the awards/agreements will be retained in the studies without any change.

Regeneration

- 1 In the case of Krishna, Godavari and other basins, where Tribunal Awards are available, the estimated regeneration to the stream for irrigation, domestic, industrial and other uses for the NWDA studies might be as specified in the Award. In the case of other basins/sub-basins, the estimated regeneration in the NWDA studies might be at the rate of 20% of the irrigation use from major and medium irrigation projects, no regeneration from minor irrigation projects and 80% from both of the domestic and industrial uses from surface water resources. No regeneration would be assumed for domestic and industrial uses from groundwater resources. The percentage of regeneration may undergo change based on the scientific studies to be carried out in this regard.

Special Technical Points related to Himalayan Component Studies

1 Intensity of irrigation

Considering availability of considerable groundwater potential in the basins of the Himalayan rivers, it was decided that the areas where existing irrigation intensity is less than 100%, the same maybe increased to level of 100% from surface water. Wherever, the existing intensity of irrigation is more than 100% the intensity can remain at the same level. Additional intensifications over and above those indicated above may be carried out by using groundwater to encourage conjunctive use and to avoid the problems of water logging and salinity.

2 Irrigation in the enroute areas

The areas enroute of the link canals not covered by any other irrigation scheme may be provided with irrigation to the extent of 100% intensity from the surface water and any additional irrigation by groundwater.

3 Irrigation in the target areas

The target area should be covered by extensive irrigation and an intensity of not more than 100% should be provided from the transferred water.

4 Water requirements downstream of diversion points

While carrying out water balance studies at the point, where diversions are contemplated, the water requirements will also include the committed utilizations and additional requirements of downstream areas, which cannot be met from the water available downstream.

5 Seasonal water balance

Water balance study at diversion points where reservoir is contemplated will be carried out on annual basis as most of the flows can be considered to be regulated. However, at diversion point where reservoirs are not contemplated, water balance study will be carried out on a seasonal basis.

Allowable Lifting of Water for Inter Basin Water Transfer Links

Present maximum allowable limit of lift 120m may be enhanced beyond 120m but subject to techno-economic viability of the project and ensuring that the economic cost of pumping / electricity charges has to be taken into account and not the subsidized cost of pumping / electricity charges)

**Guidelines regarding the extent of Surveys and Investigations
Necessary for Preparation of Feasibility Report**

1 Inter-State links

The guidelines as prepared by NWDA regarding the extent of Surveys and Investigations necessary for preparation of Feasibility Report accepted by the TAC.

2 Intra-State link proposals

Regarding technical guidelines for preparation of PFR/FR of Intra-State links, Director General, NWDA proposed to follow same technical guidelines as adopted for surveys and investigations for preparation of feasibility report of Inter basin water transfer proposal prepared and got approved from TAC in 1996. TAC agreed to use these guide lines for preparation of Feasibility Report of Intra State link proposals also.

**Guidelines for Preparation of
Preliminary Water Balance Reports
(As finalised by Task Force for ILR
In its 8th meeting)**

**NATIONAL WATER DEVELOPMENT AGENCY
GUIDELINES FOR THE PREPARATION OF PRELIMINARY WATER
BALANCE REPORT**

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Chapter 1

INTROUDCTION

1.1 General

The overall water situation of the country shall be indicated briefly. The national perspectives for water resources development including Himalayan and / or Peninsular component shall be briefly discussed in this para. Also brief background about creation of NWDA and scope of studies shall be indicated.

1.2 The report

Total number of reports to be studied under relevant components shall be indicated in this para. The name of sub-basin to be studied shall be indicated in this para.

1.3 Methodology adopted for working out water balance.

The procedure / methodology adopted for working out water balance covering type of soil, estimation of yield, ground water potential, water requirement, regeneration etc., shall be briefly described in this para with sub paras as required.

Chapter 2

BASIN AND SUB-BASIN

2.1 Basin

Brief description of the basin shall be indicated in this para. This shall include total catchment area, total length of river, percentage of area lying in various states, latitude and longitude of basin and its important tributaries.

2.2 Sub-basin

Brief description of the sub-basin indicating place of origin of river / tributary, its course, length, latitude and longitude of sub-basin, important tributaries and state-wise break up of catchment area shall be given in this para.

Table giving name of states and districts falling in the catchment area of districts and their percentage to the total geographical area of the sub-basin shall be furnished.

If the variation in catchment area of any basin/ sub-basin between NWDA and State Government figures is within 5% there is no need to revise the figures. The area considered by NWDA shall be taken as final.

Index map showing river basins in India and also Index map of the basin / sub-basin showing river and tributaries, important towns, railway lines, national highways etc as Plate 1 and administrative map showing States/districts/talukas and their headquarters as Plate 2 shall be appended to the report.

2.3 Topography, Physiography, Geology and Hydrogeology

2.3.1 Topography and Physiography

The main topographical and physiographical features of the basin/sub-basin shall be briefly described here.

2.3.2 Geology

Different geological formations occurring in the basin / sub-basin shall be indicated here.

2.3.3 Hydrogeology

Based on the information collected from Central Ground Water Board, the hydrogeological formations of the basin/sub-basin including groundwater availability shall be briefly described. Details of water bearing formation etc. shall be indicated in Plate-3.

2.4 Climate

Various seasons and their period shall be indicated. General description of climate of each season of the year shall be indicated.

2.4.1 Rainfall

Number of rain gauge stations located in the basin along with the period of availability of rainfall data, maximum, minimum and normal rainfall etc., shall be described in this para supported with Annexures. In annexure, sources of data viz. from IMD, State Governments shall be indicated.

2.4.2 Temperature

Monthly and annual ranges of variation of temperature of the basin / sub-basin as observed in IMD observatories in and nearest to the basin / sub-basin shall be indicated supported with Annexures.

2.4.3 Relative humidity

Variation of mean relative humidity, month wise as observed in IMD observatories in or around the basin / sub-basin shall be indicated in this para supported by annexure.

2.4.4 Wind speed

Data on wind speed in the basin / sub-basin as observed in IMD observatories in or around the basin / sub-basin shall be indicated month-wise in annexure.

2.4.5 Sunshine

The maximum and minimum range of monthly sunshine hours in percent as observed at IMD observatories in or nearest to the basin / sub-basin shall be indicated in this para supported with suitable Annexures.

Chapter 3

SOILS AND LAND USE

3.1 Soils

General information regarding data/soil surveys based on which information is furnished shall be indicated including limitations. The type of soils lying in the basin/sub-basin shall be indicated.

Properties of each type of soil, namely colour, depth, chemical characteristics, PH value, texture, structure, drainages etc. shall be briefly described in sub-paras.

A map showing different type of soils in the basin/sub-basin shall be appended as plate 4.

3.2 Land irrigability classification

Brief description of land irrigability classification based on physio-chemical characteristics of soil or as obtained from detailed soil survey data shall be discussed in brief in this para. Area under each class shall also be presented in tabular form, if such information is available.

3.3 Land use

Annual land use particulars of the basin/sub-basin shall be collected for the latest five years available from Bureau of Economics and Statistics of respective State Governments and shall be presented state-wise in the form of suitable annexure. Culturable area which comprises of land under miscellaneous crop and trees, current fallows, other fallows, culturable waste and net area sown for the five years under compilation shall be presented in a tabular form. The details of land use particulars for the year in which culturable area is found to be maximum shall be reproduced in tabular form and shall be used in the study.

3.4 Land holdings

Details of land holding in the basin/sub-basin be compiled from district wise figures and presented in tabular form showing number of holdings for different size groups, their area and percentage of total area.

3.5 Cropping pattern

Details of areas under various crops in the basin/sub-basin shall be collected from State Bureau of Economics and Statistics for both irrigated and unirrigated area and presented in the form of suitable annexure. Also, designed cropping patterns of some of the important existing, ongoing and future major and medium projects shall be collected and presented in the form of Annexure. The prevalent cropping pattern in the basin/sub-basin shall be briefly described and suggested cropping pattern based on same for proposed major, medium and minor projects with 150%, 125% and 100% intensities of irrigation respectively shall be presented in a tabular form. The intensity of irrigation for proposed projects shall be taken as proposed by States Govt. and shall be restricted to above value.

In case of such future projects for which project reports have already been approved by CWC, the cropping pattern as given therein should be considered and for other future projects cropping pattern will be based on the availability of water and agro-climate zone.

Fodder crops should be included in the cropping patterns recommended by the NWDA in the water balance studies.

Chapter 4

REGIONAL ECONOMY

4.1 Population

The total population, rural and urban population of the basin/sub-basin based on the latest census data shall be reported. The average density of the population in the basin/sub-basin shall be indicated.

4.2 Forest

The area covered by the forest and percentage to geographical area shall be indicated. Type of forest shall be briefly mentioned along with names of important species.

4.3 Agriculture and animal husbandry

The net area sown and its percentage to the geographical area of basin/sub-basin, crops grown etc., shall be indicated. Types of implements used in agriculture and live stock population as per latest census may be indicated.

4.4 Irrigation

The gross area irrigated from canals, tanks and wells and its percentage to gross cropped area shall be indicated. The source wise irrigation for the latest 5 years shall be appended as an annexure. Source of data shall be indicated in the annexure.

4.5 Power

The existing, ongoing and proposed Thermal, Hydel and Atomic power stations, if any, in the basin/sub-basin shall be reported.

4.6 Mineral wealth

Important minerals found in the sub-basin shall be mentioned.

4.7 Industries

Various types of industries including cottage and small scale existing in the sub-basin shall be mentioned.

4.8 Communication

National highways, railway lines connecting, important places in the basin/sub-basin, airport and seaport shall be mentioned.

Chapter 5

Water Availability

5.1 General

Purpose of the chapter shall be indicated in this para.

5.2 Surface water resources assessment

5.2.1 Past studies conducted by other agencies

Past studies conducted by other agencies for assessment of surface water resources shall be briefly described in this para indicating their assessment at various dependabilities.

5.2.2 Availability of rainfall data

The availability of rainfall data of various rain-gauge stations in and around the basin/sub-basin which are considered for working out weighted average rainfall of the basin/sub-basin shall be indicated. Missing data of the raingauge station, if any, shall be estimated using standard statistical methods.

Weighted average monsoon rainfall of the entire basin/sub-basin for the long term period (at least 35 years) for which data is available and also of the basin/sub-basin upto the selected G&D site for the period of availability of runoff data shall be computed by Thiessen polygon method. Details of computation are to be presented in the form of suitable annexure.

5.2.3 Availability of observed discharge data

Gauge and Discharge sites maintained by different Agencies/States and Central Water Commission shall be indicated. The period of availability of data and drainage area covered in respect of each site shall also be shown in a table. The consistency of observed discharge data shall be checked thoroughly. If observed discharge data for particular years is found to be inconsistent, it should be rejected and reasons thereof shall be explicitly indicated.

5.2.4 Upstream utilisation

Details of year-wise existing utilisation in the basin/sub-basin upstream of the G&D site shall be collected from State Govt. Sources and presented in the form of suitable

annexures. In the absence of data, appropriate values of delta may be assumed for estimating utilisation.

Storage effect on account of both Irrigation and Hydel projects be considered to arrive at virgin yield.

While working out virgin yield, regeneration at the rate of 20% of net utilisation from existing major, medium projects and also from imported water upstream of G&D site shall be considered. Virgin monsoon yield upto the selected G&D site shall then be worked out adding upstream utilisation from existing major, medium and minor projects (excluding utilisation from imports) to the observed monsoon yield and deducting regeneration. Details of computation shall be presented suitably in an annexure.

5.2.5 Computation of yield:

Rainfall-runoff relationship for monsoon period *as a whole* shall be developed by regression analysis both for linear and nonlinear form of equations.

The form of equation to be used shall be as follow:

- (i) $Y = a+bx$
- (ii) $Y = ax^b$

Details of computation shall be presented in annexure including graphical plot of rainfall Vs runoff. Best fit regression equation shall be selected on the basis of least standard error of estimate and co-efficient of correlation not below 0.70.

Weighted average monsoon rainfall of each year shall be substituted in the selected regression equation to develop long term monsoon yield series of the basin/sub- basin. The monsoon yield shall be worked out as a percentage of net non-monsoon yield to virgin monsoon yield from the observed set of run-off data and corresponding utilization. The computation shall also be presented in the form of annexure. The annual yield series shall be arrived at by adding both the monsoon yield and the non-monsoon yield. The yield shall be arranged in descending order in the same annexure and annual yield at 75% and 50% dependabilities shall be computed therefrom. The location of G&D sites and the hydro-meteorological stations, annual normal isohyets shall be shown in Plate 5.

When the catchment of a basins/sub- basin is sub divided for estimation of dependable yields, using observed flow data of more than one G&D site, the long term annual yields series for each part catchment shall be estimated as indicated above. The annual yields of each year of such part catchments shall be added to arrive at annual yield series for the whole basin/sub- basin. Thereafter dependable yields of whole catchment shall be estimated using procedure stated above.

In case where there are no G&D sites or the existing G&D sites cover only a small portion of the catchments, rainfall-runoff relationship obtained for the adjoining hydro-meteorologically similar basin/ sub-basin may be adopted.

The surface water yield need not be worked out at the state boundaries. The existing procedure for deciding the best-fit equations on the basis of the minimum standard error of estimate may continue.

Hydrological studies may be updated after a period of 10 years when additional data will be available.

5.3. Import/Export

Details of import from existing, ongoing and future identified projects located outside the basin/sub-basin shall be collected from State Govt. sources and briefly described here. Similarly, details of export, outside basin/sub-basin from existing, ongoing and proposed projects located within the basin/sub-basin shall also be collected from State Govt. and briefly described. The details of import and export shall be presented in the form of suitable annexure giving details of annual irrigation and annual utilisation in respect of each of the project.

5.4. Ground water assessment

5.4.1. Ground water availability based on CGWB estimates

Ground water potential and existing draft of the basin/sub-basin shall be computed on proportionate area basis from the latest data collected from Central Ground Water Board, in absence of which from statistics of State Ground Water Boards and presented in an annexure. Ground water may be indicated as a separate resource State wise.

5.5 Allocation of water as per Tribunal Award

In case any Tribunal Award is existing for any basin/sub-basin, the same shall be briefly described and allocation to each State presented in tabular form giving reference to Tribunal Award, page number etc. in respect of the particular project.

5.6 Availability of Surface Water

The water balance study should consider the surface water resources only while estimating the water balance in a river basin/sub-basin

Water availability upto the project site to be checked on the basis of the following:

- V. Flow series are based on observed data and corrected for existing utilization.

VI. Extended flow series are based on rainfall-runoff correlations for the project site.

VII. Extended flow series based on rainfall-runoff correlations for the nearest hydro-meteorologically similar watershed.

VIII. Prorata Basis

- 50% and 75% yield computed as above may further be adjusted for the ultimate utilizations upstream, exports and imports to compute 50% and 75% dependable availability.
- Water utilizations for any project should be restricted to a maximum of 75% dependable availability in case of diversions. However, for storage projects requirement may exceed 75% dependable availability with provisions of carryover storage.
- Suitability of dam site: This aspect may be accepted as per the information provided by the State Governments/Master Plan.

5.7 Seasonal water balance

For Himalayan Component the aspect of Seasonal water balance may be followed as given below:

Water balance study at diversion points where reservoir is contemplated will be carried out on annual basis as most of the flows can be considered to be regulated. However, at diversion point where reservoirs are not contemplated, water balance study will be carried out on a seasonal basis.

Chapter-6

Water Needs

6.1. General:

The various needs that are to be met while planning for water resources development is to be indicated here.

6.2. Domestic water requirement:

It is expected that population of India will hopefully stabilise by 2050 AD. Hence domestic water requirements shall be worked for this ultimate situation. Domestic water requirement for urban, rural and livestock population of the basin/sub-basin shall be worked state-wise.

The total and rural population of the basin/sub-basin shall be assessed on proportionate area basis from the latest available district-wise census data using the following formula and as per latest revision of UN publication "world population prospectus" on medium variant growth rate:

$$P_{2050} = P_{1911} (1+r)^n \quad \text{where}$$

r = annual compound rate of growth

n = nos. of year

Details of computation shall be presented in the form of Annexure.

The livestock population of the basin/sub-basin shall also be assessed on proportionate area basis from district-wise census data published by Bureau of Economics and Statistics of respective State Govt. and shall be projected to 2050 AD on the basis of same formula as above, but considering an annual compound growth rate of 1%. Details shall also be furnished in the form of Annexure.

Domestic needs shall be estimated considering per capita daily water requirement for urban and rural population as *135 litres and 70 litres* respectively as prescribed by the erstwhile Ministry of Works and Housing, Government of India in their manual "Water supply and Treatment". For livestock population, 50 litres per capita requirement shall be taken in the absence of standard norms. The ultimate domestic needs shall be worked out State-wise and presented in tabular form. The full requirement of urban population and 50% of rural population shall be considered to be met from surface water sources and the requirement of remaining 50% of rural population and entire livestock population shall be met from ground water.

Regeneration as return flow to the stream shall be worked out as 80% of surface water utilised for domestic purposes.

6.3. Surface water needs for irrigation:

The data relating to existing, ongoing and proposed major, medium and minor irrigation projects shall be compiled from the master plans prepared by the State Governments including project reports and other relevant documents. The estimate based on this data will be the ultimate irrigation requirement in a basin/sub-basin.

6.3.1. Irrigated area under existing projects:

Details of existing major, medium and minor projects in the basin/sub-basins shall be collected from respective State Irrigation departments and indicated in this para. Also if any irrigation is presently being provided in the basin/sub-basin through any projects located outside the basin/sub-basin, the same is also to be indicated in this para. The annual irrigation from existing projects shall be considered as the designed annual irrigation from all projects including from import and shall be presented in the form of annexure giving details of G.C.A., C.C.A, actual and designed annual irrigation, intensity of irrigation and annual utilisation in respect of each project also indicating source of data therein.

6.3.2. Annual irrigation from ongoing projects:

Details of major, medium and minor projects under construction in the basin/sub-basin shall be collected from respective State Irrigation Departments and indicated in this para. Also if any irrigation is proposed to be extended in the basin/sub-basin, from any project under construction outside the basin/sub-basin, same shall also be indicated in this para. The annual irrigation from ongoing projects shall be considered as the designed annual irrigation as indicated in respective project reports/State Master Plan including same from import and shall be presented in the form of an annexure giving details of GCA, CCA designed annual irrigation, intensity of irrigation and annual utilisation in respect of each project also indicating source of data therein.

6.3.3 Annual irrigation from identified future projects:

Details of major, medium and minor projects identified for future implementation in the basin/sub-basin shall be collected from respective State irrigation Departments and indicated in this para. Also, if any irrigation to the basin/sub-basin is proposed from any identified future projects located outside the basin/sub-basin, same shall also be indicated in this para. The intensities of irrigation shall however be considered as 150%, 125% & and 100% in respect of major, medium and minor projects respectively and annual irrigation from identified future projects shall be worked out accordingly. An annexure indicating GCA, CCA annual irrigation intensity of irrigation, annual utilization etc. as per

State Govt. and annual irrigation as proposed by NWDA in respect of each project shall also be presented indicating source of data therein.

In case of such basins/sub-basins, where annual irrigation from existing, ongoing and identified future projects is less than 60% of the culturable area of the basin/sub-basin, the balance of area shall also be considered to be provided with irrigation under future projects so as to bring the annual irrigation to cover atleast 60% of culturable area and additional area to brought under irrigation would be for a single dry crop without considering any high water consuming crop like sugarcane and paddy. 50% of such additional area shall be assessed to be covered by major and medium projects and balance by minor projects.

For studies related to Himalayan Component Studies the following procedure may be followed:

(i) Intensity of irrigation

Considering availability of considerable groundwater potential in the basins of the Himalayan rivers, it was decided that the areas where existing irrigation intensity is less than 100%, the same maybe increased to level of 100% from surface water. Wherever, the existing intensity of irrigation is more than 100% the intensity can remain at the same level. Additional intensifications over and above those indicated above may be carried out by using groundwater to encourage conjunctive use and to avoid the problems of water logging and salinity.

(ii) Irrigation in the enroute areas

The areas enroute of the link canals not covered by any other irrigation scheme may be provided with irrigation to the extent of 100% intensity from the surface water and any additional irrigation by groundwater.

(iii) Irrigation in the target areas

The target area should be covered by extensive irrigation and an intensity of not more than 100% should be provided from the transferred water.

(iv) Water requirements downstream of diversion points

While carrying out water balance studies at the point, where diversions are contemplated, the water requirements will also include the committed utilizations and additional requirements of downstream areas, which cannot be met from the water available downstream.

6.3.4 Water use from the existing and ongoing projects:

Designed annual utilization from the existing projects (major, medium and minor) in the basin/sub-basin shall be indicated in this para alongwith designed annual utilization from existing imports. The same shall also be included in the annexure prepared for irrigated area under existing projects.

Similarly designed annual irrigation from ongoing projects (major, medium and minor) in the basin/sub-basin shall be indicated in this para alongwith designed annual irrigation from ongoing imports. The same shall also be included in the annexure prepared for irrigated area under ongoing projects.

6.3.5 Water requirement of areas to be irrigated by identified future major, medium and minor projects:

Water requirement for identified future projects shall be worked out using climatological approach. The cropping pattern to be considered is as suggested in Chapter-3. Crop water requirement in respect of crops proposed shall be computed considering monthly values of potential Evapo-transpiration (PE) of IMD observatory located in or nearest to the basin/sub-basin (average in case of more than one station being in the basin/sub-basin) as given in IMD Publication ‘Potential Evapo-transpiration (PE) over India’ (Scientific Report No.136, Feb. 1971). Monthly Evapo-transpiration and rainfall normal of the stations for the concurrent period shall be given in an annexure. Irrigation efficiency of 65% in case of major and medium projects and 80% in case of minor projects shall be considered. Details of computation shall be presented in the form of Annexure.

Average delta for each category of project shall be worked out considering actual evaporation losses (to be worked out based on the Evapo-transpiration data available in the vicinity), however in the absence of actual data on evaporation the same may be adopted as 20% of gross irrigation water requirement of crops and details of computation presented in the form of Annexure.

Water requirement for identified future projects shall then be worked out considering total annual irrigation under each category of projects multiplied by their respective average delta and presented in tabular form. The same shall also be included in the annexure for irrigated areas under identified future projects indicating annual utilization as proposed by State Govt. and also by NWDA therein respect of each project.

The ultimate water requirement as assessed for existing, ongoing and future projects in the basin/sub-basin shall also be presented in a tabular form.

Location of existing, ongoing and future major and medium projects in the basin/sub-basin shall be presented in Plate-7. Command areas of the projects including those from import and also arable area in the basin/sub-basin as per irrigation Atlas, of the CBIP shall also be indicated in the same Plate.

6.3.6. Regeneration:

Regeneration at the rate of 20% of net water utilization in the basin/sub-basin for irrigation from all existing, ongoing and identified future major and medium projects as also from imports shall be indicated in this para and also presented in a tabular form. No regeneration shall be considered from minor irrigation projects.

6.4 Hydropower needs:

Details of all hydropower projects existing, under construction and proposed as collected from State Govt. sources and the publication ‘Hydropower Potential of India’ of CEA shall be indicated in this para. Evaporation losses from storages as indicated in respective projects reports/State Master Plan in respect of each project shall be considered as consumptive use for Hydropower needs and shall be indicated in this para.

Details shall also be presented suitably in the form of Annexure.

6.5 Industrial water needs:

Details of water requirement for all existing, under construction and future industries collected from State Industries Department shall be indicated in this para supported by suitable annexure. However, in case details are not available, it shall be assumed that industrial water requirement at the ultimate stage shall be of the same order of ultimate domestic water requirement of basin/sub-basin and to be met from surface water requirement.

Regeneration at the rate of 80% of industrial water requirement to be available as return flow to the stream shall also be indicated in this para.

6.6 Salinity needs:

A lumpsum provision of 10% of 75% dependable yield is to be considered towards salinity control in respect of such basins/sub-basins for which State Govts. have kept necessary provision in their Master Plan.

6.7 Ultimate surface water requirement:

The ultimate surface water requirement in respect of all needs in the basin/sub-basin shall be presented in this para giving state -wise break up in a suitable tabular form.

CHAPTER-7

WATER BALANCE

The water balance position of the basin/sub-basin shall be presented in this chapter in following paras in following fashion:-

7.1 General

The water balance taking into account the availability, import, export, needs and regeneration is given below :-

7.2 Surface Water Unit: Mm³

7.2.1 Availability

a) Gross annual yield

- i) At 75% dependability
- ii) At 50% dependability

b) Surface water import (+)

c) Surface water export (-)

d) Overall availability

- i) At 75% dependability
- ii) At 50% dependability

7.2.2 Surface water requirement for

- i) Irrigation by in-basin & impoted water
- ii) Domestic use
- iii) Industrial use
- iv) Hydropower needs
- v) Salinity control

Sub-total

7.2.3 Regeneration from (+)

- i) Domestic use
- ii) Industrial use
- iii) Irrigation use

Sub-toal

7.2.4 Surface water balance	Surplus(+)	Deficit (-)
a) At 75% dependability		
b) At 50% dependability		

7.3 Ground water

	State A	State B	State C	Total
a) Gross ground water potential				
b) Existing Draft				
c) Balance ground water available for irrigation				

CHAPTER-8

OBSERVATIONS AND CONCLUSIONS

8.1 Observations

- a) The forest are in the basin/sub-basin for the year in which culturable area is found to be maximum shall be indicated here both in ha. and as percentage of total geographical area of the basin/sub-basin.
- b) The maximum culturable area of the basin/sub-basin both in ha. and as percentage of total geographical area of the basin/sub-basin shall be indicated here.
- c) The net area sown in the basin/sub-basin in the year in which culturable area is found to be maximum shall be indicated both in ha. and as percentage of geographical area of the basin/sub-basin.
- d) The designed annual irrigation and corresponding utilization in the basin/sub-basin by existing projects from surface water shall be indicated here.
- e) The designed annual irrigation and corresponding utilization in the basin/sub-basin by ongoing projects from surface water shall be indicated here.
- f) The designed annual irrigation as proposed by State Govts. in the basin/sub-basin by identified future projects from surface water shall be indicated here.

8.2 Conclusions

- a) The 75% & 50% dependable annual surface water yields of the basin/sub-basin shall be indicated here.
- b) The gross ground water potential of the basin shall be indicated here.
- c) The estimated annual irrigation and corresponding utilization in the basin/sub-basin by identified future projects from surface water shall be indicated here.
- d) Estimated ultimate surface water requirement for all uses (including e-flow) in the basin/sub-basin shall be indicated here.
- e) The ultimate annual irrigation in the basin/sub-basin shall be indicated here both in ha and as percentage of maximum culturable area.
- f) The ultimate estimated import to the basin/sub-basin shall be indicated here.

- g) The ultimate estimated export from the basin/sub-basin shall be indicated here.
- h) The quantum of surplus/deficit of surface water at 75% dependability considering import, Export and regeneration shall be indicated here.