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IRRIGATION ENGINEERING

[BTAI 2201]

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Need of Irrigation:

Diverse Uses of Water

- **Off-stream use** : Irrigated Agriculture, Domestic & Industrial water supply, thermal & nuclear power generation
- **Instream use** : Hydro-electric Power, Fisheries, Navigation

Irrigation water is supplied to **supplement** water available from **rainfall and the soil moisture in the crop root zone** and the contribution of **soil moisture from the groundwater**.

Quantity and timing of rainfall is not adequate to meet nutritional demand from crops.

A **2.5%** increase in food production per year is required to meet the nutritional demand **growing population** of India (**about 2% per year**).

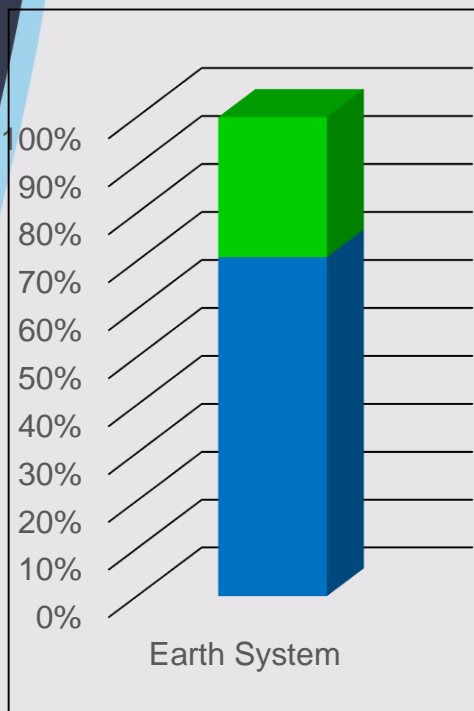


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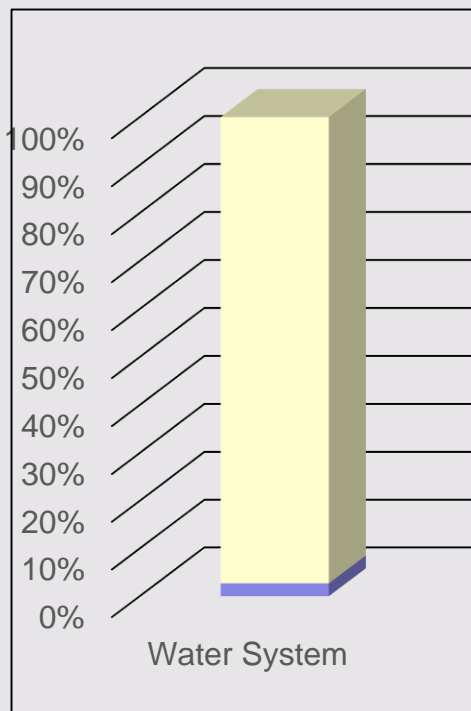
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Sources of Irrigation:

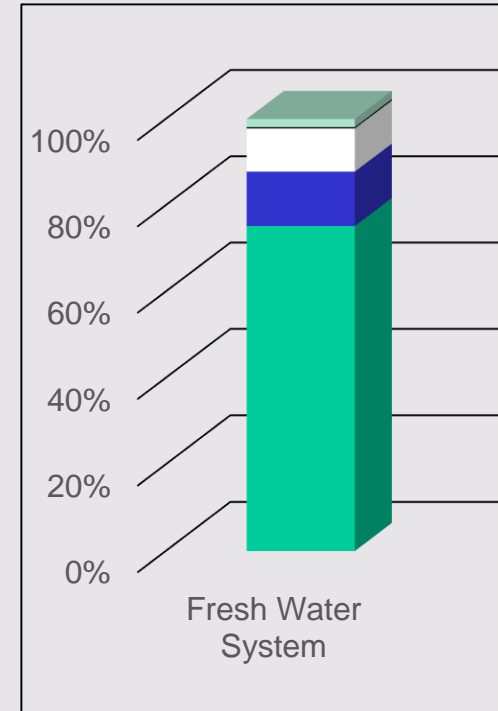
Global Water Scenario



■ Water ■ Land



■ Fresh Water ■ Salt Water



■ Glaciers ■ Deep GW
■ Accessible GW ■ Lakes and Rivers
■ Others



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Sources of Irrigation:

India has greater diversity and variety of climate and extremes of weather conditions.

The climatic factors profoundly influence the availability and utilization of water resources

- Precipitation: the basic source of water in the form of rainfall or snowfall.

There are 130 rainy days on average (75 days have RF below 2.5mm)

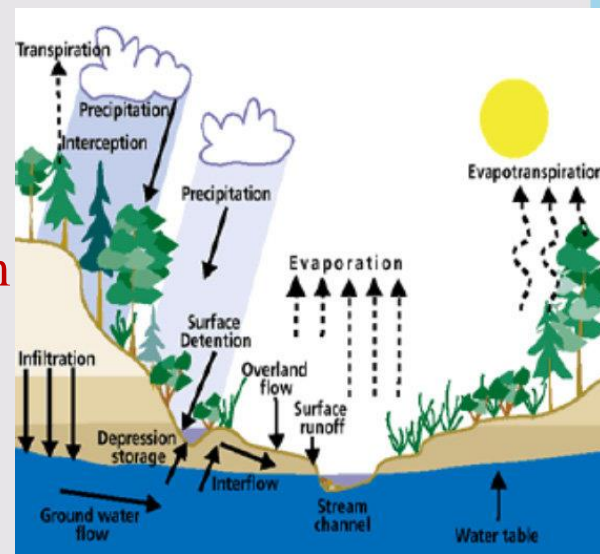
- **Surface water Resources:**
- **Groundwater Resources:**

Average annual precipitation: **400 Mha-m**

Lost to atmosphere : **70 Mha-m**

Surface runoff: **115 Mha-m**

Infiltrates into the ground: **215 Mha-m**





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Classification of Irrigation Works in India:

During the pre-plan period (prior to A.D. 1951), irrigation projects were classified on the basis of culturable command area.

From 1951 to 1978, the classification was based on the cost involved in the scheme.

Since 1978, the irrigation projects are again been classified on the basis of culturable command area of the project.

Accordingly the irrigation projects are presently classified into following categories:

- Major Irrg. Project: $CCA > 10,000$ ha
- Medium Irrg. Project: $2,000$ ha $< CCA < 10,000$ ha
- Minor Irrg. Project: $CCA \leq 2,000$ ha

Tanks, Diversion works, River lift

Minor irrigation schemes comprises of surface water minor irrigation schemes and groundwater minor irrigation schemes.

Dug well, Bore well, Tube Well

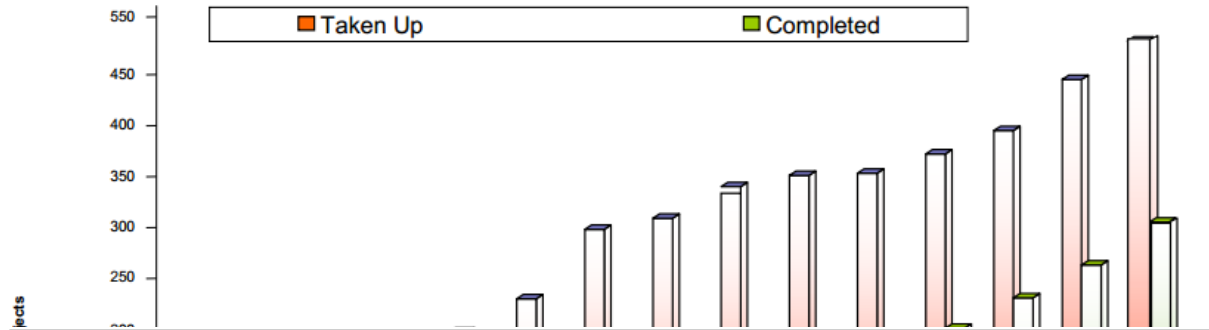


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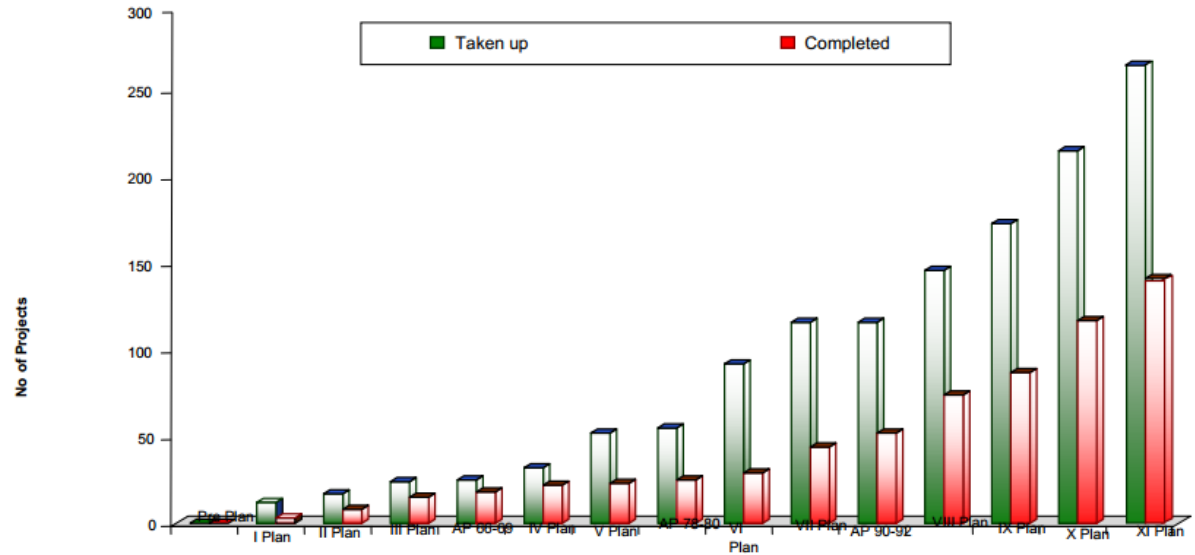
Major Irrigation Projects

Taken up and Completed during Pre-Plan and Plan Period (Cumulative)



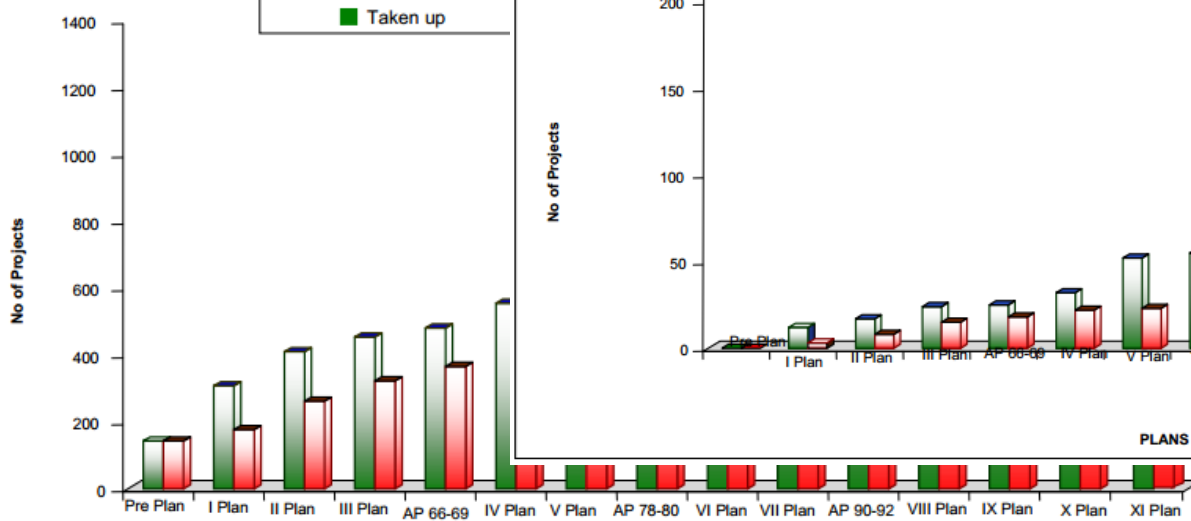
ERM PROJECTS

Taken up and Completed during plan period (Cumulative)



MEDIUM

Taken up and complete



PLAN

PLANS



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Environmental Impact of Irrigation Projects:

Any direct human influence on environment shall have a positive objective, namely to raise the living standard of a community.

However, certain activities could cause undesirable side effects, unless they re planned and executed carefully.

All water resource development projects have social and environmental implications.

- ✓ Irrigation projects invariably **change the river flow characteristics** and **eco-system regime** of the downstream river course and the command areas.
- ✓ Major ecological impacts include the **submergence of the extensive areas of fertile land**, **dislocation of human habitats**, **modification of the micro-climate of the region** and **alteration of flora and fauna of the neighbourhood**.



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Environmental Impact of Irrigation Projects:

- ✓ The beneficial impact is the reduction in flow and consequent reduction of floods in the plains adjoining the river courses.
- ✓ The adverse effects are the deterioration of water quality, reduction in the sediment carrying capacity of the river.
- ✓ The capacity of the river to flush the pollutants which accumulate during the non rainy season is greatly reduced.
- ✓ Low flows may prevent survival of uniquely adopted species. Dams also interfere with the growth of migrating fish.



An arch dam is a concrete dam that is curved upstream in plan. The arch dam is designed so that the force of the water against it, known as hydrostatic pressure, presses against the arch, causing the arch to straighten slightly and strengthening the structure as it pushes into its foundation or abutments.



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