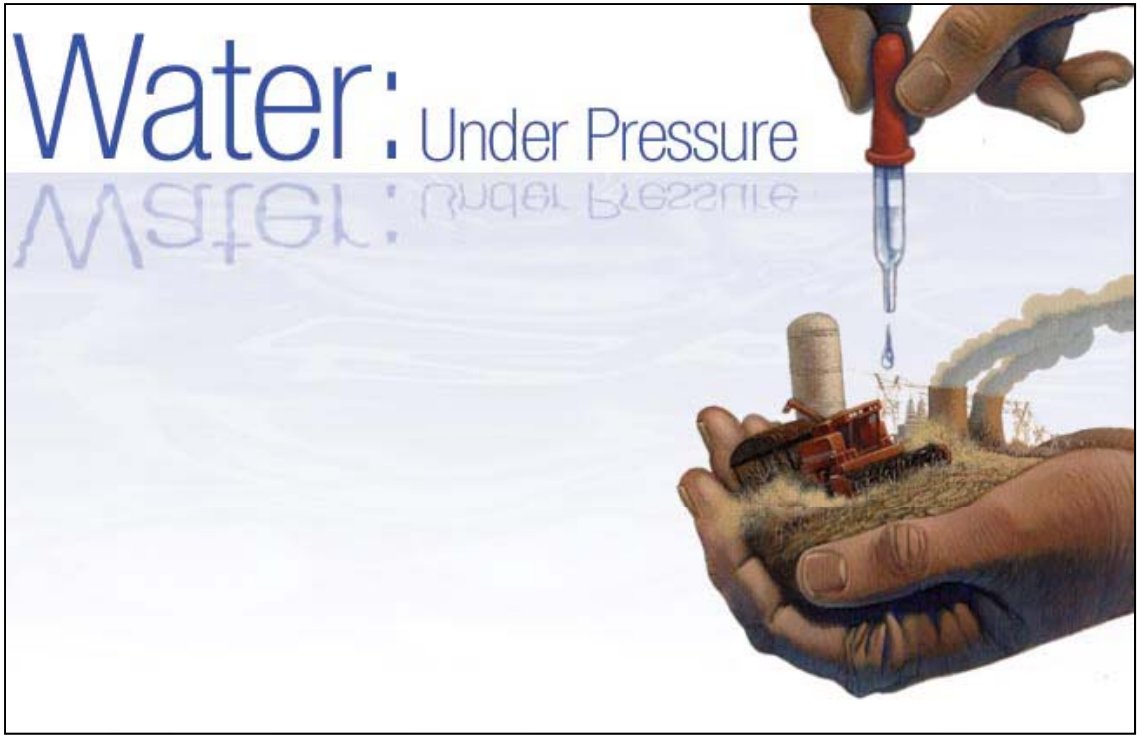
SUSTAINABLE URBAN GROUND WATER MANAGEMENT
Present scenario and future challenges



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A Key Resource

- *In urban development, Ground Water plays a key role, as surface water sources are inadequate.*
- *But it is perhaps the most neglected resource.*
- *The resource is not being given the desired importance.*

URBAN SCENARIO

- **There are overall 630 major and small townships in U.P.**
- **Majority are located on alluvial aquifers of Indo-Gangetic plain**
- **Dependency on ground water for drinking & allied purposes, especially in big cities have mushroomed**
- **In most of the other urban centers, 80-90% of drinking water demand is being met through tube wells & hand pumps.**
- **Private tube well construction activity, especially in multistory buildings & housing colonies, is going on unchecked**

URBAN GROUND WATER- UNDER STRESS

- **The resource is being extracted without having any knowledge of its potential.**

- **Ground water domain in Urban centers of U.P.**
  - **under severe stress, both quantitatively & qualitatively.**

- **Unscientific and unregulated ground water extraction in urban areas have almost reached to unsustainable levels.**

- **Poor quality trends of groundwater have also emerged as possible threat to potable water supplies.**

URBAN SCENARIO

- **The reason being that no methodology could be evolved so far for estimating the resource potential within the urban domain.**
- **Due to concrete development, vertical recharge in urban areas has gone down appreciably and the dynamic resource potential has almost exhausted.**
- **Over-exploited condition developed in Lucknow, Kanpur, Ghaziabad and other areas.**
- **Overall situation of groundwater resource in urban centers is quite grave, but it has never been given due recognition.**

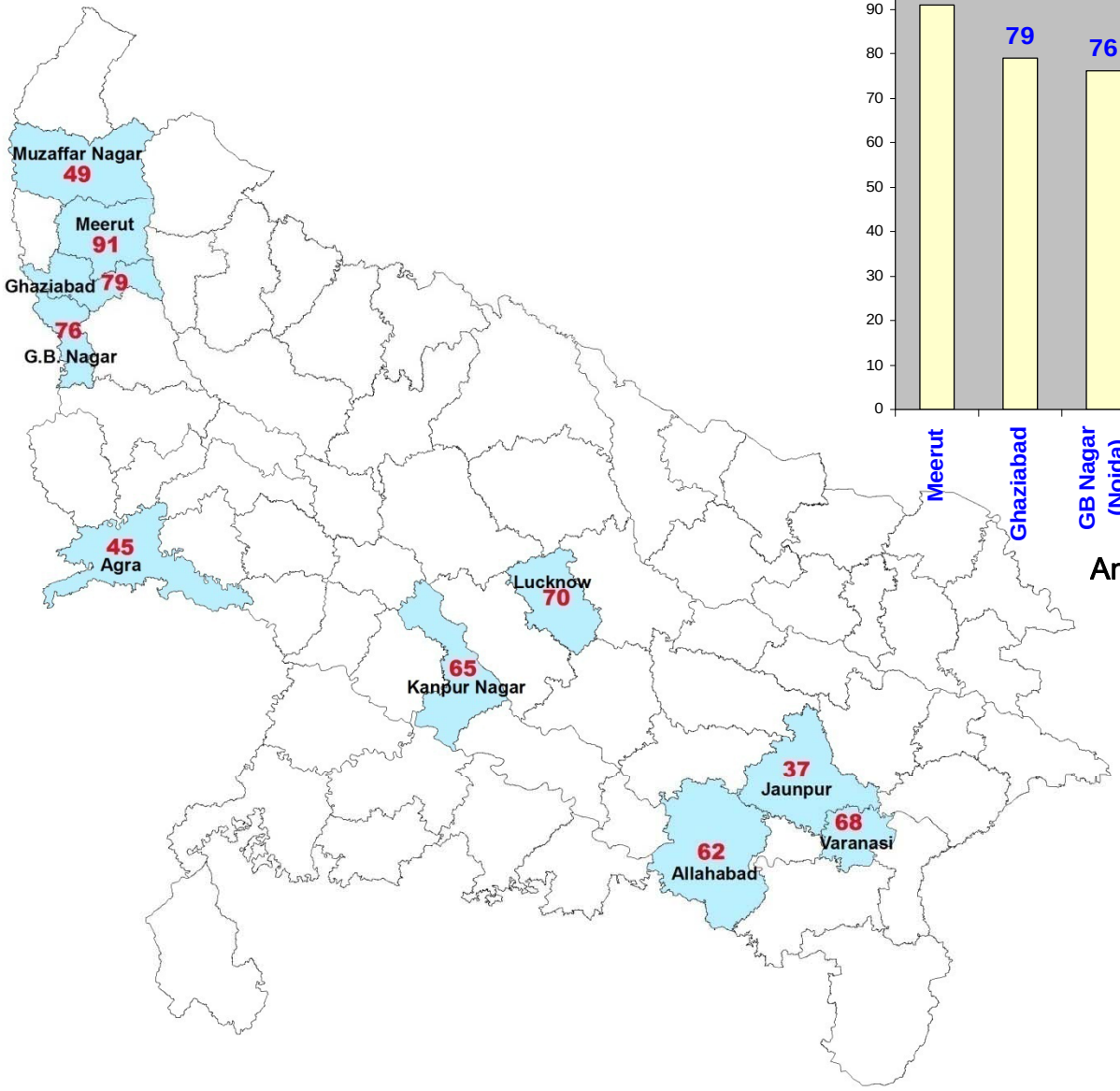
URBAN ISSUES

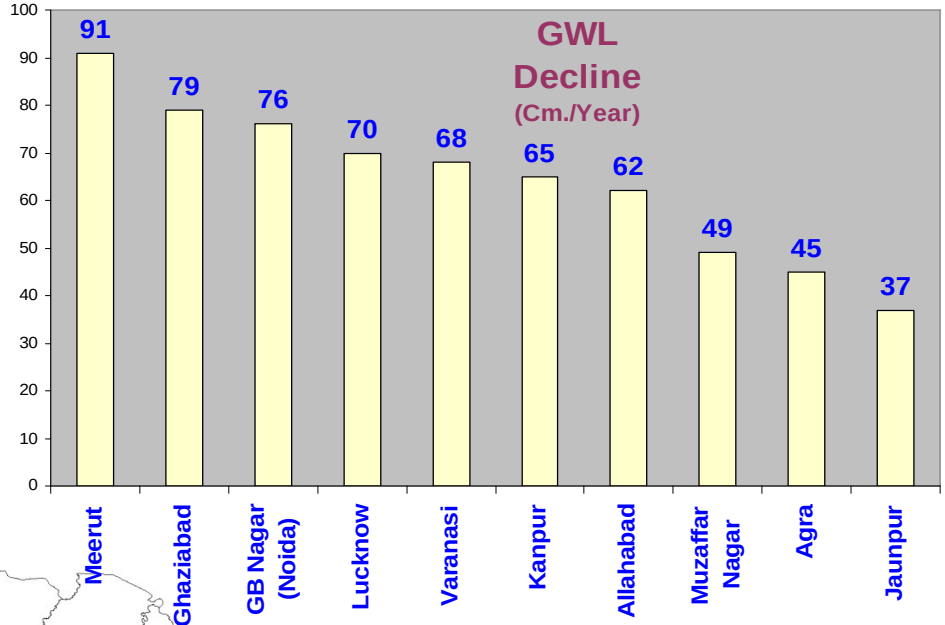
- **The resource availability of urban groundwater is not known**
- **Micro level urban aquifer dynamics of Ganga basin is also not clear**
- **Urban rain water harvesting has been started in hurry without the prior study of urban hydrogeological conditions.**
- **Scientific aspects of recharging are being ignored.**
- **Unscientific implementation of recharge schemes may pollute the alluvial aquifers, which once get polluted, can never be revived.**
- **Various gaps & lacuna in development & management process of urban ground water.**

Alarming Situations in Urban Centers

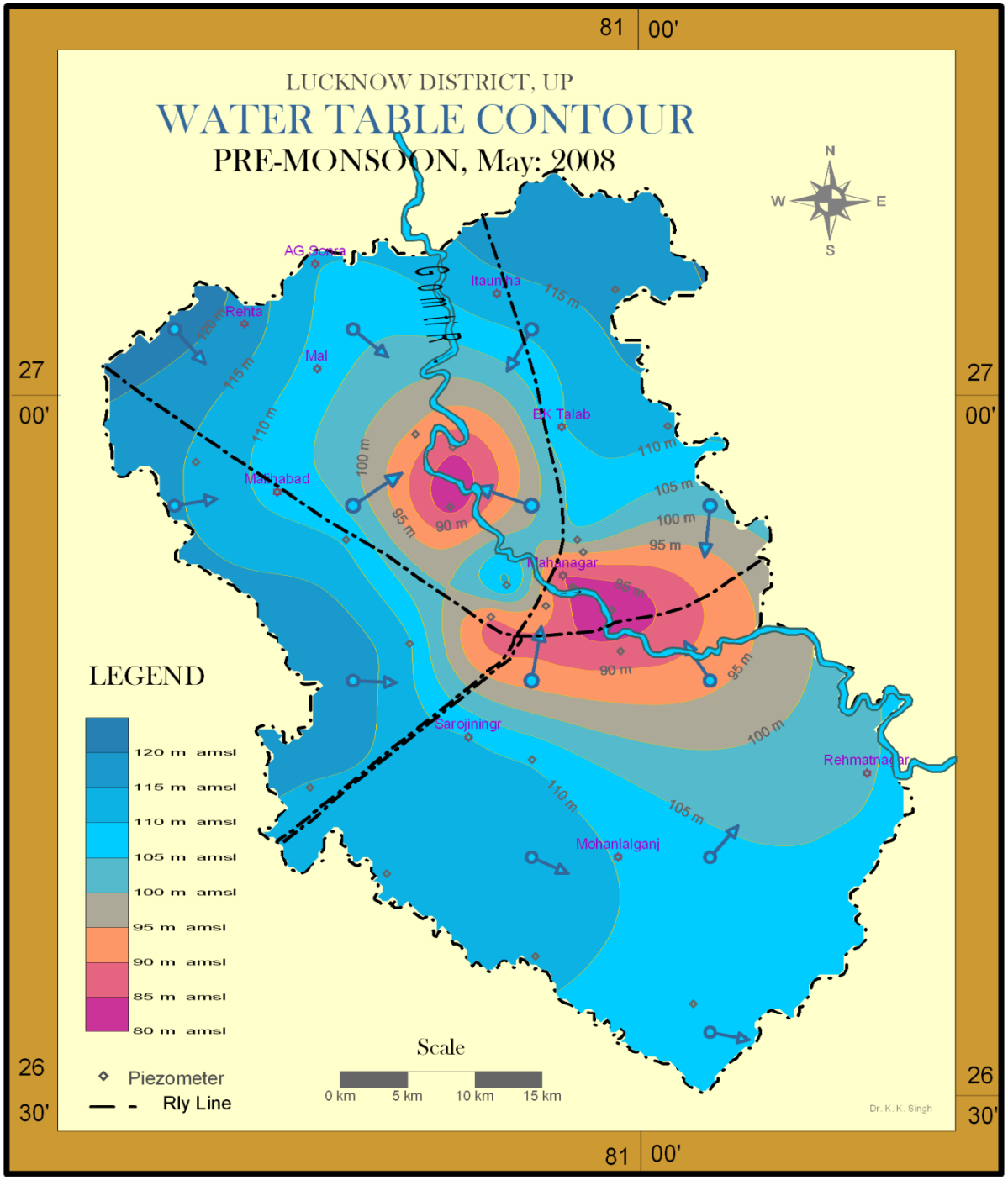
- **In urban centers, ground water situations are much more disturbing.**
- **The rate at which ground water levels in major cities are going down, it is possibly difficult to rejuvenate/recover.**
- **The reason being that the drinking water supplies are heavily dependent on ground water.**
- **Major cities including Lucknow & Kanpur are experiencing high water level decline due to over exploitation & resultant stress on aquifer group I (upto 150 mbgl).**
- **Lucknow city: Glaring example of 'Hydrogeological Stress' with ground water level decline of 50 cm to 1.5 Mt./yr.**

YEARLY GROUND WATER LEVEL DECLINE IN MAJOR CITIES OF UTTAR PRADESH





Annual average decline between 2007-2011


LUCKNOW DISTRICT, UP
WATER TABLE CONTOUR
PRE-MONSOON, May: 2008
N
W
E
S
81 00'
27 00'
26 30'
Gomti R.
Itaunjha
Renta
Mal
BK Talab
Mashabad
Mahanagar
Sarojiningr
Rehmatnagar
Mohanlalganj
120 m
115 m
110 m
105 m
100 m
95 m
90 m
85 m
LEGEND
120 m amsl
115 m amsl
110 m amsl
105 m amsl
100 m amsl
95 m amsl
90 m amsl
85 m amsl
80 m amsl
Piezometer
Rly Line
Scale
0 km 5 km 10 km 15 km
Dr. K. K. Singh

URBAN GROUND WATER RESOURCE ESTIMATION: *NO NORMS, NO EFFORT*

- **Scientific norms have not been evolved for the urban areas.**
- **This is the reason that ground water resource potential for the urban areas is not known**
- **Indiscriminate resource development is taking place on unscientific lines.**
- **No regulation for Ground water exploitation.**

SEPARATE NORMS REQUIRED

- **GEC-97 norms are not suitable/ valid for computing the groundwater resources of urban areas**
- **In urban areas the vertical recharge components may be quite small**
- **Total vertical recharge may be severely curtailed**
  - **Due to large paved areas**
  - **Almost complete absence of the recharge form applied irrigation/canal seepage**
- **Vertical Recharge shall be only the rainfall recharge.**
- **Hence, separate norms are required for urban areas.**

SCENARIO OF RAIN WATER HARVESTING -SOME FACTS

- **Since 2000, various rain water harvesting schemes executed by different agencies in the state.**
- **But the desired results could not be obtained.**
- **The scientific & engineering approach in the implementation of RWH schemes is missing.**
- **The concept is yet to be scientifically understood.**
- **There is no effective implementation & monitoring mechanism in the state**

RWH – AN "AREA SPECIFIC ISSUE"

Rain Water Harvesting structure is an area / site specific system.

- **'Hydrogeology' is the most vital component of RWH, providing base line informations for planning, designing and implementation of RWH & Ground Water recharge programme in an area.**
- **Locations feasibility.**
- **Rainfall data.**
- **Water level decline & depth to ground water.**
- **Magnitude of ground water extraction.**
- **Status of ground water resource.**
- **Lithological configuration.**
- **Qualitative & quantitative aspects.**

GUIDELINES FOR RWH & GWR

Ground Water Department has issued detailed guidelines in April,2006- which are not being followed

- **Areas of continuous Ground Water level Decline**

❑ **- Where post-monsoon ground water level is more than 8 mt. deep b.g.l.and annual decline of water level is above 20 cm. in pre-monsoon. (This condition pertains to Alluvial region).**

❑ **- In Hard rock region of Bundelkhand- Vindhyans,the depth to water level limit will be 5mt.bgl.**

- **Over-exploited / Critical Blocks**

- **Over- exploited Urban Areas**

POLICY INITIATIVES IN RAIN WATER HARVESTING

Govt. of UP has initiated Rain Water Harvesting and Ground Water Recharge Programme in the State in a big way and various initiatives have been taken.

- **Executive Committee under the Chairmanship of Chief Secretary constituted to review RWH schemes in the State.**

- **Ground Water Deptt. declared as "Nodal Agency" to monitor RWH & GW Management.**

- **TCC under chairmanship of DM for RWH Projects.**

----POLICY INITIATIVES

- **16th to 22nd July declared as Ground Water Week.**

- **RWH introduced as subject for 6th to 8th class.**

- **Ground Water Policy declared on 18th Feb, 2013.**

----PROVISIONS OF RWH & GWR

- **DECISIONS TAKEN –**

- **Conserving existing ponds / reservoirs in new housing schemes.**
- **Provision of 5% land for water body.**
- **DEPTHS OF PONDS – 3 mts (Identify natural catchment & feasibility assessment).**
- **In parks, only 5% area be covered with concrete / pavements.**

----PROVISIONS OF RWH & GWR

- **Foot paths / tracks be provided with permeable/ perforated blocks. Pavements should not be concrete.**
- **Recharge shaft not to be constructed in ponds where risk of industrial/other polution may occur.**
- **Direct recharging of rain water to aquifers from open/paved/unpaved areas is not permitted (as per G.O. April,2006).**

ROOF TOP RAIN WATER HARVESTING (POLICY DECISIONS)

- **In lay- out plans of (newly/ proposed) Group Housing schemes (Govt./Pvt.), separate network of pipes for combined RWH / recharging system be provided.**

- **Vide G.O. Dated 01-07-08, Housing department, GOUP, has modified the initial provisions of RWH, wherein recharging system made compulsory for plots of 300 sq.m. & above.**

- **GOVT./SEMI GOVT. BUILDINGS :**

  Installations of RWH/GWR structures are made compulsory for all Govt./semi Govt. buildings in the state.

COMBINED RECHARGE SYSTEM
(A new policy provision)

- **Combined Recharge System has been made mandatory for new housing colonies.**

- **Order issued by Housing Department in June, 2009**

POLICY DECISIONS FOR INDUSTRIES

- **For Ground Water Level/Quality monitoring, PIEZOMETERS made compulsory for industries.**

- **Rain Water Harvesting: All industries, including existing and new, which are drawing ground water shall mandatorily undertake artificial recharge measures.**

CHALLENGES & GAPS

- No rules/ provisions for existing housing colonies, leaving a major chunk of urban areas, remain unutilized for RWH.
  - A big gap.
- The collective system of Roof Top RWH is the most feasible and potential option to conserve the storm water run-off especially in the existing residential colonies.
- Rain Water harvesting is being carried out in Isolation.
- No effective monitoring/ implementation mechanism
- No department made responsible for assessing the impact of RWH, the exact benefit is yet to be estimated.

---CHALLENGES & GAPS

- **Area specific concept & the geo-scientific guidelines not being followed.**
- **Hydrogeological parameters being neglected**
- **Pre-project hydrogeological surveys in mega schemes not conducted.**
- **In spite of the ban, rain water from paved / unpaved area, parks, open fields is allowed in some cases for direct recharging of aquifers. This is a matter of pollution risk.**
- **Various provisions of Government orders on RWH are not being properly implemented.**

---CHALLENGES & GAPS

- Construction of recharge shafts in ponds has not been stopped, despite risk of contamination.
- No mechanism to monitor the status of RWH in private buildings.
- There are gaps in the implementation methodology.
- Maintenance of recharge structure, especially roof top system is being totally ignored. Such negligence may lead to chocking of structure with risk of bacteriological pollution.
- There is also no mechanism of assessing impact of recharge schemes.
- Line departments are implementing recharge schemes in isolation.
- Overall, the monitoring & implementation mechanism in the state is almost fragmented.

RWH IN PARKS AGAINST NORMS

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Direct Recharging – A criminal negligence

- The direct recharging of rain water run-off through recharge wells from unpaved areas is not allowed.
- It may pollute the aquifers.
- The filters usually provided in such RWH systems can only check the physical impurities.
- The chemical contaminants dissolved in the run-off water can not be separated/ checked through this filtration method.
- Such contaminants will percolate into aquifers through injection wells.
- Such recharging should be discouraged.
- Should be treated as an act of criminal negligence for polluting the aquifers.

Unscientific Recharge System in Ram Manohar Lohia Park, Lucknow closed

- Way back in 2005, a RWH project was undertaken in Ram Manohar Lohia Park situated in Gomti Nagar, Lucknow.
- Hydrogeological considerations were ignored.
- 29 recharge wells of 60 m. depth constructed for recharging the storm water run-off from the open, unpaved catchment of the park.
- It was found that there were all chances of percolation of contaminated water from unpaved area directly into the aquifer and pollute ground water.
- Subsequent to directions, the concerned agency sealed all Recharge Wells constructed in the park to avoid any risk of groundwater contamination.

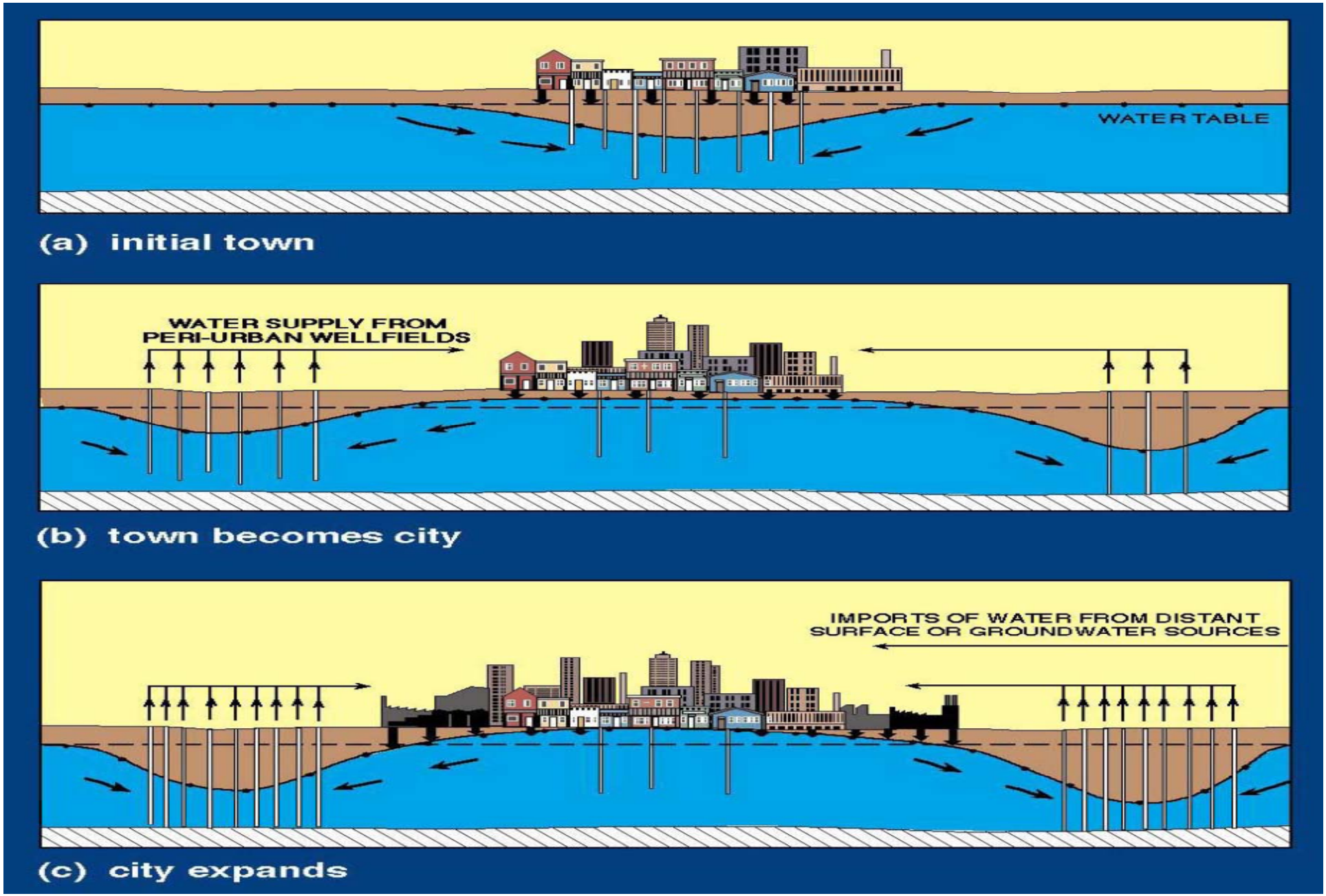
Undesirable Wastage of Ground Water

- Most of the urban water supplies are dependent on ground water.
- Due to faulty distribution system & pipe leakages and wastage, there are 40% losses.
- In Lucknow city, groundwater based municipal supply is about 300 MLD.
- With the pattern of leakages and overflows from water tanks in majority of the houses, about 120 MLD of ground water is being wasted, which goes to sewer lines.
- If it is saved and extra exploitation is regulated, the damage to aquifers can be checked & declining water levels will improve.

INTERVENTIONS NEEDED- URBAN AQUIFERS NEED IMMEDIATE RESPITE FROM FURTHER GROUND WATER EXTRACTION

- A separate long term IWRM Plan be prepared for a more harmonized conjunctive use of surface and groundwater.
- Excessive withdrawals from top aquifers (<150 mbgl) should be adequately reduced & regulated through a legislative provision.
- Strict measures with public awareness campaigns, are required to check undesirable wastage of drinking water.
  - Through the effective implementation of above 2 measures, ground water withdrawals can be certainly lowered down.
- The peri-urban region of urban agglomerates envisaging prolific aquifers can be systematically exploited to supplement city's water supply.
- Existing tube wells need to phased out.

MANAGEMENT OPTION FOR URBAN AREA



NEED TO MANAGE URBAN GROUND WATER

- **Separate methodology/norms for Urban Ground Water Assessment should be formulated on priority basis.**
- **Comprehensive urban ground water management plans with separate regulatory provisions should be prepared .**
- **Withdrawals from Stressed Aquifers should be strictly regulated & minimized.**
- **Rain Water Harvesting & Recharging plans should be perceived in totality & not in isolation.**
- **In Rain Water Harvesting, risk of ground water contamination should never be ignored.**


THANK YOU