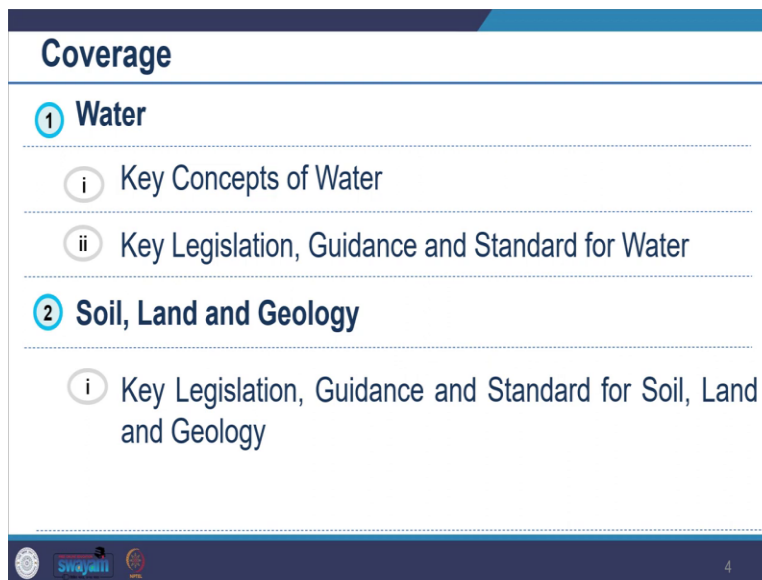


Environmental Impact Assessment
Professor Harshit Sosan Lakra
Department of Architecture and Planning
Indian Institute of Technology, Roorkee
Lecture 16

EIA- Law, Policy and Institutional arrangements for EIA System (Part-IV) Water, Soil, Land & Geology

Welcome to the course Environmental Impact Assessment. In the previous lectures, we developed an understanding of air policy. So, we looked at very domain-specific laws and policies in place. So, today we will cover in this session we will cover key legislation, guidance, and standards related to water, Soil, Land, and Geology. And about this, detail methods we will be looking at the method section, and we will see what key legislation guidance and standards are involved in this.

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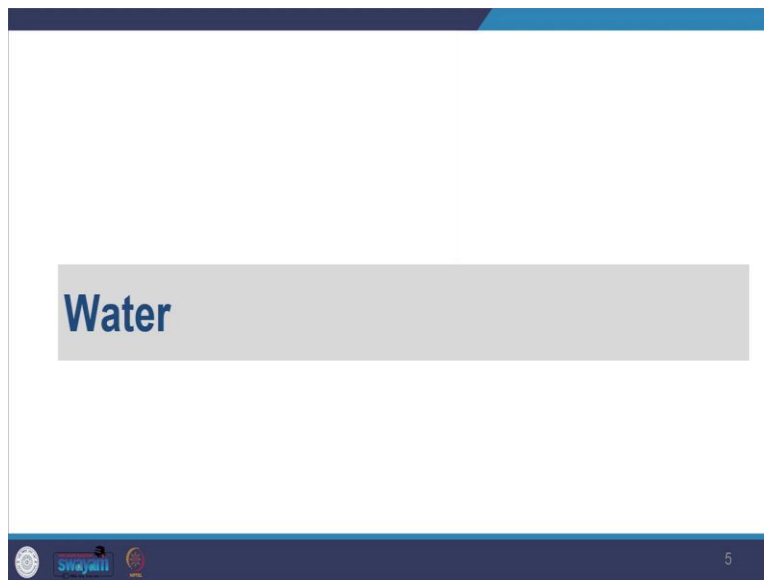
The slide, titled "Coverage", outlines the following topics:

- ① **Water**
 - i Key Concepts of Water
 - ii Key Legislation, Guidance and Standard for Water
- ② **Soil, Land and Geology**
 - i Key Legislation, Guidance and Standard for Soil, Land and Geology

The slide also features logos for IIT Roorkee and Swajanti at the bottom left, and the number 4 at the bottom right.

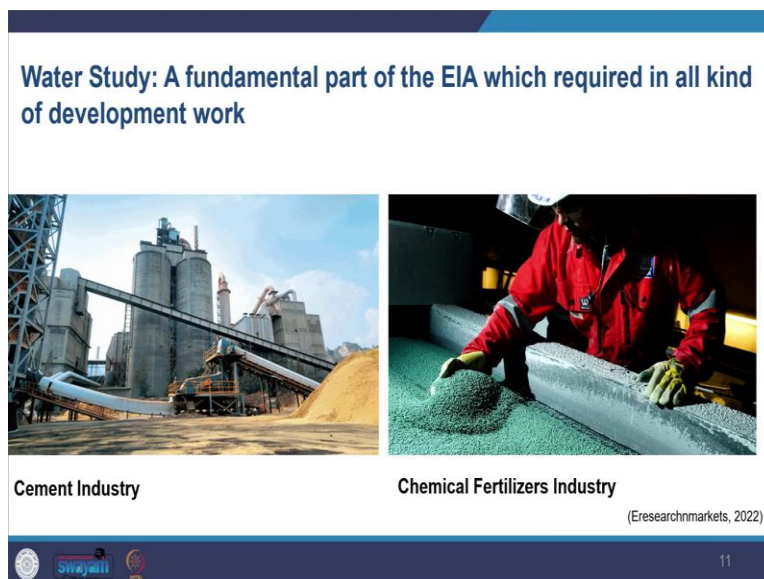
So, our coverage will include like we will look at the key concepts of water, then we will look at key legislation guidance and standards for water which are there and then we will look into Soil, Land, and Geology and legislations related to that.

(Refer Slide Time: 01:15)



So, looking at water, we see that water study is a fundamental part of EIA, and it is required in all kinds of development work. So, if you think about various kinds of development projects, you would not think about whether it would be using water and then it would be influencing what it would be there would be impact on water.

(Refer Slide Time: 01:40)



So, for example, in the Cement Factory, while providing environmental description, as a professional while preparing environmental impact assessments, you would be required to look into the surface air quality of nearby water sources and surface drains, these all have to be confirmed and then you might have to take as per the guidelines provided, you might have to take a minimum these water quality from eight locations, and even hydrological system how the waters moving should be prepared and how your project is going to interfere with the water movements should also be checked.

So, you see how much it is going to be required. Similarly, you can see in another example of Chemical Fertilizers Factory and the project description, that you might have to tell where you are going to get the water from what will be the total water requirements and what approvals you have got from the concerned department.

So, all that will be needed. You might have to also work out the water balance cycle data including the quantity of effluent you are going to generate, the waste you are going to generate and then how much you are going to recycle, how much you are going to reuse, and how much you are going to discharge.

And then you also need to maintain the quality of the receiving water body and minimize effluent discharge into the receiving water body. And then you would also be required to give the details of the effluent treatment plant and also a mode of disposal how you are going to dispose of all the waste which you will be generating.

So, this like a lot will be involved with water. So, in your environmental description, you would be also giving in your baseline data like on water the surface water was the quality of source which the like from where you are getting and which could be a dam or river or nearby water body. So, all that needs to be provided in detail, and there is an anticipated impact on water. So, what kind of impact it would have further the impact and many other components?

(Refer Slide Time: 04:11)

Other Water Dependent Impacts



Impact on Biodiversity



Impact on Human Health



Impact on Soil

(The Spruce / Jayme Burrows, 2022; Web, 2022)

Swayamii

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There would be a direct impact on water, but there would be also indirect impacts as we had studied various categories or categories of impact. So, you have seen direct and indirect so what is going to have a lot of indirect impact also? So, like impact on biodiversity on soil and human health.

(Refer Slide Time: 04:39)

Key Legislation, Guidance and Standards for Water


Swayamii

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International Example

November 2010

EU WATER



The EU Water Framework Directive

In 2000, the European Council and a group of member states adopted the Water Framework Directive (WFD). It introduces a new holistic approach to managing and protecting water, based not on national or political boundaries but on natural geographical and hydrological formations: river basins. It also requires coordination of different EU policies, and sets out a precise timetable for action, with 2015 as the target date for getting all European waters into good condition.

Link:
<https://ec.europa.eu/environment/pubs/pdf/factsheets/water-framework-directive.pdf>

The EU Water Framework Directive

Water supports life. It is a crucial resource for humanity, generating and sustaining economic and social progress. It is also at the core of natural ecosystems and climate regulation.

The EU Water Framework Directive (WFD), adopted in 2000, takes a pioneering approach to protecting water based on natural geographical formations: river basins. It sets out a precise timetable, with 2015 as the deadline for getting all European waters into good condition.

Europe's water is under pressure. Economic activities, population growth and urbanisation are increasing pressures on freshwater throughout Europe.


Unless stronger action is taken, 47% of EU surface waters will not have good ecological status by 2015.

About 25% of groundwaters have poor chemical status due to

The WFD is complemented by other, more specific, EU laws:

- The Environmental Quality Standards Directive (2008)
- The Marine Strategy Framework Directive (2008)
- The Floods Directive (2007)
- The Groundwater Directive (2006)
- The Bathing Water Directive (2006)
- The Drinking Water Directive (1998)
- The Urban Wastewater Directive (1991)
- The Nitrates Directive (1991)

Link:
<https://ec.europa.eu/environment/pubs/pdf/factsheets/wfd/en.pdf>



The EU Water Framework Directive

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With this background in mind let us look into the Legislation Guidance and Standards for Water. So, the key legislation guidance and standard for water involves like all the, at the international level examples you will find is the Water Framework Directive WFD and this is for the European countries you find and Water Framework Directive. This particularly helps to identify what kind of impact how it is going to have on the deterioration of the ecological status as a result of the development activity.

So, whatever you want to do, how it is going to influence that, and then WFD, it requires the hydromorphic conditions it creates, you have to create that hydromorphic conditions where you need to tell them how you are complying how you are assessing and complying with the regulations.

So, what is the water condition, and how you are taking care of how you are complying with all the requirements? So, trying to understand what is hydromorphic, hydromorphic condition is typically described as the interrelationship between the flow how the water is flowing, and then the channel parameter.

And then also the so all that has to be given and geomorphological baseline information like what is the condition there that all needs to be given the formation what form it has. So, that all needs to be provided here in the EIA documents as per the Water Framework Directive. So, typically, the Water Framework Directive, compliance assessment forms a technical appendix to surface water in an EIA chapter.

So, how you are doing it, you might have to give it in the appendix section, the entire detailed thing, for the flood risk assessments, has to be done and you need to show how you are minimizing the likelihood of any flood happening in the new project and how you are going to handle it if that flooding or flooding happens in somewhere nearby places.

(Refer Slide Time: 07:01)

The World Bank requires ESIA of projects proposed for bank financing through its Operational Policy 4.01 and Environmental Assessment Sourcebook

Operational Policy 4.01

Environmental Assessment Sourcebook

Link: http://web.worldbank.org/archive/wbsite01541/WEB01_2097.HTM

Link: https://books.google.co.in/books?id=O5vTSHVveOC&printsec=frontcover&source=gbis_ge_summary_r&cad=0#v=onepage&q&f=false

Bank Assists in Key Priority Areas

- Consideration of cross-sectoral impacts in a regional setting (e.G. A river basin)
- Restoration and preservation of aquatic ecosystems
- Avoidance of the water-logging and salinity problems associated with irrigation investments
- Also specifies pollution and abatement measures and emission levels

(Glasson, J., & Therivel, R., Routledge, 2019)

So, now looking at the policies. So, if you look at the World Bank, World Bank requires all the proposals EIA of the project, which are seeking funding through the bank, they all need to be referred to the Environmental Assessment Sourcebook. So, within that policy, if you look at it is particularly 4.07 is concerned specifically with water resource management.

So, here it gives you the policy, how you are going to take care of all the things, and bank involvement in water resource management includes support for all things it considered, it considers flood control, it considers potable water, sanitation facilities, water for productive activities, and, in the economically viable manner.

So, whichever way you are doing it, you can economically sustain it, and also environmentally sustainable and it should also take care of this socially equitability, which means everyone should get water. So, that has to be given. So, the bank also supports the borrowers in key priority areas and also sick cross-sectoral impacts in the regional setting.

So, like, how it is going to have, like impact on the river basin and so on. And then how you are also taking care of the restoration, preservation of the aquatic ecosystems and how you are avoiding waterlogging and then the salinity problems so that all developers who are developing this need to take care of all these aspects.

And then it also the World Bank specifies pollution and how what kind of measures can be adopted to keep the emission levels at the normal acceptable, which is acceptable standards as per the World Bank. And EIA reports when you prepare EIA reports from the World Bank's perspective, it needs to take into account all the variations and pollution prevention measures which would be you have to comply with the local country-specific guidelines and Laws and Acts.

(Refer Slide Time: 09:30)

Institution	Mandate	Subunit	Subunit function
MoEF&CC	Formulation of policies and programs for the conservation of natural resources and pollution abatement and guidance for sustainable development and enhancement of human well-being (MoEF&CC, 2017a)	CPCB	Provision of technical services to MoEF&CC regarding the Environment (Protection) Act, 1986. According to the Water Act, 1974, their function is to promote cleanliness of streams and wells in different areas of the States by prevention, control and abatement of water pollution (CPCB, 2019)
		SPCB	Inspect wastewater treatment facilities; enabled to tighten standards; evolve methods of treatment and utilization of sewage or related disposal (Singh, 2014)
MoHUA	a) Formulation of policies, sponsorship and support programs b) Coordination of activities of various Central Ministries, State Governments and other nodal authorities c) Monitoring programs concerning housing and urban affairs (MoHUA, 2017a)	CPHEEO	Technical wing of the ministry with specialists in public health engineering/environmental engineering. The organization does not only support the ministry in policy formulation but also handholds states by way of technical advice, guidelines, scrutiny and appraisal of schemes, and propagation of new technologies. It acts as advisory body at central level for concerned state agencies and Urban Local Bodies (ULBs) in implementation, O&M (operation and maintenance) of urban water supply and sanitation projects (CPHEEO, 2019)
			Ministry of Jal Shakti
			<ol style="list-style-type: none"> 1. Overall planning, policy formulation, coordination and guidance for water resources 2. Technical guidance, scrutiny, clearance and monitoring of the irrigation, food control and multi-purpose projects 3. General infrastructural, technical and research support for development 4. Providing special central financial assistance for specific projects 5. Overall policy formulation, planning and guidance in respect of irrigation management 6. Overall planning for the development of ground water resources 7. Formulation of national water development perspective 8. Coordination, mediation and facilitation of interstate interests 9. Operation of the central network for food forecasting 10. Inter-state negotiations 11. Ensure effective abatement of pollution and rejuvenation of the river Ganga by river approach (Ministry of Jal Shakti, 2019)

(Schellenberg et. al. 2020)

So, looking at the institutions involved we have the Ministry of Environment, forests and climate change. Then also we have CPCB at the central level and SPCB state pollution control board at the state level. You have the Ministry of Housing and Open Affairs along with you also have central public health and environmental engineering organization CPHEEO and then you also see the Ministry of Jal Shakti.

So, all these institutional arrangements are there and in place related to water, and when you need to look for an acceptable range of water quality, then you look at the government bodies and agencies. So, where do I find what is the acceptable range? So, mostly the government bodies and agencies maintain that and they are the ones who set and regulate the water quality data including even the Groundwater Protection and the geomorphological, the surface feature, how of the earth like what all is there, all these things are maintained by them.

Among all the standards, the most, strict standards if you will see the most strict, standard is concerning drinking water. So, all the standards that you are going to see the most stringent one is for drinking water.

(Refer Slide Time: 11:01)

The image shows a screenshot of the Central Pollution Control Board (CPCB) website. The main heading is "Drinking Water Standards in India". Below it, the CPCB logo and name are visible, along with the Ministry of Environment, Forest and Climate Change, Government of India. The website navigation menu includes "HOME", "ABOUT CPCB", "STANDARDS", "CPCB'S ACTIVITIES", and "AIR". The "STANDARDS" section is expanded to show "Water Quality Standards". A sidebar on the left lists various standards categories like "Air Quality Standards", "Water Quality Standards", "Vehicular Exhaust", "Noise Standards/Rules", "Bio Medical Incinerators", "Auto Fuel Quality", "Common HW Incinerators", "Generator Set", and "Industry Specific Standards". The main content area displays "IS 10500 : 2012" and "Table 1 Organoleptic and Physical Parameters (Foreword and Clause 4)". The table lists parameters such as Colour, Odour, pH, Taste, Turbidity, and Total dissolved solids, along with their requirements and permissible limits. A note at the bottom of the table states: "NOTE — It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under 'acceptable' under the water are suitable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under 'permissible limit in the absence of alternate source' in col 4, above which the sources will have to be rejected."

भारतीय मानक
पाने का पानी — विशिष्टि
(द्वारा पुनर्धारण)
Indian Standard
DRINKING WATER — SPECIFICATION
(Second Revision)

IS 10500 : 2012

Table 1 Organoleptic and Physical Parameters
(Foreword and Clause 4)

Sl No.	Characteristic	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source	Method of Test, Ref to Part of IS 3025	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
i)	Colour, Hazen units, Max	5	15	Part 4	Extended to 15 only, if toxic substances are not suspected in absence of alternate sources
ii)	Odour	Agreeable	Agreeable	Part 5	a) Test cold and when heated b) Test at several dilutions
iii)	pH value	6.5-8.5	No relaxation	Part 11	—
iv)	Taste	Agreeable	Agreeable	Parts 7 and 8	Test to be conducted only after safety has been established
v)	Turbidity, NTU, Max	1	5	Part 10	—
vi)	Total dissolved solids, mg/L, Max	500	2 000	Part 16	—

NOTE — It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under 'acceptable' under the water are suitable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under 'permissible limit in the absence of alternate source' in col 4, above which the sources will have to be rejected.

<https://cpcb.nic.in/wqstandards/>

So, in India, you find the Indian standards for drinking water specification which provide permissible and desirable limits for various parameters in drinking water as per the Bureau of Indian Standards BIS, these provide specifications for potable water. So, these standards are prepared to check the water quality of the resource from where you are drawing water and to check the effectiveness of the water treatment.

So, these are used for checking the effectiveness of water treatment and supply by the concerned authority. So, whichever authority is for treating the water and supplying the water, is used for checking that. So, in the image on the left-hand side, you can see the CPCB website and then the link to all the standards.

On the right-hand side, you can see drinking water standards, which show different water characteristics acceptable limits, and methods of testing. So, you can see here all those characteristics related to color, odor, pH value, taste, then turbidity, and total dissolved solids. So, all these are so your project should meet all these requirements and acceptable limits. So, you would also find standard rules for wastewater for domestic and industrial sources.

(Refer Slide Time: 12:26)

Standards for Emission or Discharge of Environmental Pollutants for Various Industries

Effluent/Emission Updated On : 25 Oct 2021

S No.	Contents	Page No.
Schedule-I: Standards for Emission or Discharge of Environmental Pollutants from various Industries		
01.	Caustic Soda Industry	402
02.	Man-Made Fibres (Synthetic)	402
03.	Petroleum Oil Refinery	402
04.	Sugar Industry	
05.	Thermal Power Plants (TPP Amendment)	
06.	All Integrated textile units, units of Cotton / Woollen / Carpets / Polyester, Units having Printing / Dyeing / Bleaching process or manufacturing and Garment units	
07.	Composite Woolen Mills (Omitted)	413
08.	Dye and Dye Intermediate Industry	
09.	Electroplating Anodizing Industry (All related Standards Notified on 30th March, 2012)	
10.	Cement Plants	415
11.	Stone Crushing Unit	416
12.	Coke Ovens (Omitted as per Gazette Notification 31st March, 2012)	
13.	Synthetic Rubber	416
14.	Small Pulp and Paper Industry	417
15.	Fermentation Industry (Distilleries, Maltries and Breweries)	417
16.	Leather Tanneries (Omitted)	418

<https://cpcb.nic.in/effluent-emission/>

The Environment (Protection) Rules, 1986. Schedule VI

General Standards for discharge of environmental pollutants Part A: Effluents

[SCHEDULE - VI]
(See rule 3A)

GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENTAL POLLUTANTS PART-A : EFFLUENTS

S. No.	Parameter	Standards			
		Inland surface water	Public Sewers	Land for irrigation	Marine coastal areas
1	2	3			
		(a)	(b)	(c)	(d)
1.	Colour and odour	See 6 of Annexure-I	--	See 6 of Annexure -I	See 6 of Annexure-I
2.	Suspended solids mg/l, Max.	100	600	200	(a) For process waste water-100 (b) For cooling water effluent 10 percent above total suspended matter of influent.
3.	Particulate size of suspended solids	Shall pass 850 micron IS Sieve	--	--	(a) Floatable solids, max. 3 mm.

Link: <https://www.cpcb.nic.in/GeneralStandards.pdf>

In the image you can see the standards for emissions or discharge of environmental pollutants for various industries available as CPCB sites, the link is provided for your reference you can see here for all the industries, then in the following image, you can see the general standard for discharge of environmental pollutants through effluent one of the first columns you can see the parameters such as color and odor, suspended solids.

In the second column, you will find what should be the range in the inland water surface like what should be range in the Public Sewers and what if the water is discharged from the land for irrigation and then if it is discharged at the marine and the coastal areas. So, you can find all those values here.

(Refer Slide Time: 13:20)

Indian STP discharge standards over time

(MoEFCC, 1986b, 2015, 2017b; National Green Tribunal order, 2019)

Parameters	General norms ¹ 1986				Draft norms Nov. 2015**	MoEF & CC notification, Oct. 2017**	NGT order 2019**
	Inland surface water	Public sewers	Land irrigation	Marine coastal areas			
1 BOD [mg/l]	30	350	100	100	10	30 (metro cities) ³	10
2 COD [mg/l]	250	-	-	250	50	-	50
3 TSS [mg/l]	100	600	200	100 (process water)	20	100 50 (metro cities)	20
4 pH	5.5-9	5.5-9	5.5-9	5.5-9	6.5-9	6.5-9	5.5-9
5 TN [mg/l]	100	-	-	100	10	-	10
6 Ammonical Nitrogen as N [mg/l]	50	-	-	50	5 ⁴	-	-
7 Free NH ₃ [mg/l]	5	-	-	5	-	-	-
8 Nitrate [mg/l]	10	-	-	20	-	-	-
9 Diss. PO ₄ as P [mg/l]	5	-	-	-	-	-	1 ⁵
10 Fecal Coliform [MPN/100ml]	-	-	-	-	<100	<1,000	<230

¹Standards set in 1986 cover in total 40 parameters, which are not depicted in this illustration. NOTE: industrial wastewater standards are regulated under CETP (Common Effluent Treatment Plant) set, which is not focus of this study.

²Metro Cities, all state capitals except in the state of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura, Sikkim, Himachal Pradesh, Uttarakhand, Jammu and Kashmir and Union Territory of Andaman and Nicobar Islands, Dadar and Nagar Haveli, Daman and Diu and Lakshadweep Areas/Regions. ³Standards applicable for discharge into water bodies and land disposal applications, while reuse is encouraged.

⁴As SS in [mg/l] in General Norms, 1986.

⁵As Total Kjeldahl Nitrogen in General Norms, 1986.

⁶As NH₄-N

⁷Valid for Phosphorus Total for discharge into ponds and lakes.

(Schellenberg et. al. 2020)



Recommended norms of treated sewage quality for different uses (CPHEEO, 2013)

Parameter	Toilet flushing	Fire protection	Vehicle exterior washing	Non-contact impoundments	Landscaping, horticulture & agriculture				
					horticulture, golf courses	Crops		Raw	Cooked
						Non-edible crops	Edible crops		
Turbidity (NTU)	<2	<2	<2	<2	<2	AA	<2	AA	
SS	nil	nil	nil	nil	nil	30	nil	30	
TDS				2100					
pH				6.5 to 8.3					
Temp. (°C)				Ambient					
Oil and Grease	10	nil	nil	nil	10	10	nil	nil	
Minimum Residual Chlorine	1	1	1	0.5	1	nil	nil	nil	
Total Kjeldahl Nitrogen	10	10	10	10	10	10	10	10	
BOD	10	10	10	10	10	20	10	20	
COD	AA	AA	AA	AA	AA	30	AA	30	
Dissolved Phosphorus as P	1	1	1	1	2	5	2	5	
Nitrate	10	10	10	5	10	10	10	10	
Fecal Coliform/ 100 ml	nil	nil	nil	nil	nil	230	nil	230	
Helminth eggs/liter	AA ⁶	AA	AA	AA	AA	<1	<1	<1	
Color	Colorless	Colorless	Colorless	Colorless	Colorless	AA	Colorless	Colorless	
Odor				Aseptic (Not septic and no foul odor)					

⁶As arising when other parameters are satisfied.

(Schellenberg et. al. 2020)



So, in the following image, you can see general STP discharge standards, sewage treatment plan discharge here shows different parameters, inland water supply Public Sewers, land irrigation marine ecosystem, you can see as well for STP, so, again you can see here the recommended norms of treated sewage quality for different uses by CPHEEO such as toilet flushing, fire protection, vehicular exterior washing and so on you can see here. The source of all of these has been provided to you.

(Refer Slide Time: 13:56)

Technology performance (CPCB, 2013)

Assessment parameter/technology	ASP	MBBR	SBR	UASB+EA	MBR	WSP	DEWATS ⁶
Performance after Secondary Treatment							
BOD (mg/l)	<20	<30	<10	<20	<5	<40	
SS (mg/l)	<30	<30	<10	<30	<5	<100	
Fecal Coliform, Log unit	Upto 2<3	Upto 2<3	Upto 3<4	Upto 2<3	Upto 5<6	Upto 2<3	
T-N removal efficiency (%)	10-20	10-20	70-80	10-20	70-80	10-20	
Performance after Tertiary Treatment							
BOD (mg/l)	<10	<10	<10	<10	<10	<10	<20
SS (mg/l)	<5	<5	<5	<5	<5	<5	<40
TN							<10
NH ₃ N (mg/l)	<1	<1	<1	<1	<1	<1	
Total Coliforms, MPN/100 ml	10	10	10	10	10	10	

⁶DEWATS technology serves as comparative for nature-based solutions due to lack in data availability for other systems.

(adapted with data based on DEWATS by Singh et al., 2019; Schellenberg et al. 2020)



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Overview of policies and acts in India for wastewater management

1974	Water (Prevention and Control of Pollution) Act	Prevention and control of water pollution in maintaining or restoring of the wholesomeness of water through the establishment of pollution control boards (central & state level) for implementation ⁶ .
1986	Environment Protection Act	Provision of protection and improvement of the environment in a broader sense, including the human environment ⁶ .
1995	National Environment Tribunal Act	Provision of strict liability for damages arising out of any accident by hazardous substances; establishment of a National Environment Tribunal for effective and expeditious disposal of cases arising from such accidents ⁶ .
2008	National Urban Sanitation Policy	All Indian cities and towns become totally sanitized, healthy and liveable and ensure and sustain good public health and environmental outcomes for all their citizens with a particular focus on hygienic and affordable sanitation facilities for the urban poor and women ⁷ .
2011	National Mission for Clean Ganga	Ensure effective abatement of pollution and rejuvenation of the river Ganga by adopting a river basin approach to a) promote intersectoral coordination for comprehensive planning and management and b) maintain minimum ecological flows in the river Ganga ⁸ .
2012	National Water Policy (NWP)	NWP proposes the recycling and reuse of water including return flows for demand management and efficient use of water, incentives through efficient water pricing ⁹ .

⁶M&EPC (1974), accessible via <https://cpcb.nic.in/displaypdf.php?id=aG9ZS3YXRlc1w2e2dVpqb24wRG9jMj5wZGY=>.

⁷M&EPC (1986), accessible via <https://cpcb.nic.in/displaypdf.php?id=aG9ZS3YXRlc1w2e2dVpqb24wRG9jMj5wZGY=>.

⁸NGT (National Green Tribunal) (1995), accessible via http://www.greentribunal.gov.in/FileDisplay.aspx?file_id=hp6qpcv0Y1hc20Yg8S8k&CFwF7gi7AbtS183%2FRorgJufTbWwFcg%3D%3D.

⁹MoUD (2008), accessible via <http://www.indiaenvironmentportal.org.in/files/nusb.pdf>.

¹⁰NIMCG (2019), accessible via https://nmcg.nic.in/about_nmcg.aspx.

¹¹MoWR (2012), accessible via http://mowr.gov.in/sites/default/files/NWP2012Eng6495132651_1.pdf.

(Schellenberg et al. 2020)



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And in this image, you can see the technology performance. Or how which technology performs. So, in the again this image you can see different acts related to water, Water Prevention and Control of Pollution Act 1974, the Environmental Protection Act 1986, the National (Environmental) Environment Tribunal act you can see Urban Sanitation Policy, the National Mission for Clean Ganga, National Water Policy. So, depending on where your projects are and what it has to comply with.

(Refer Slide Time: 14:33)

Water quality criteria under designated best use classes (CPCB, 2017a)

Designated-best-use	Class of water	Criteria
Drinking water source without conventional treatment but after disinfection	A	- Total Coliforms < 50 MPN/100 ml - pH between 6.5 and 8.5 - Dissolved Oxygen > 6 mg/l - BOD ₅ days 20°C 2 mg/l or less
Outdoor bathing (organized)	B	- Total Coliforms < 500 MPN/100 ml - pH between 6.5 and 8.5 - Dissolved Oxygen > 5 mg/l - BOD ₅ <3 mg/l or less
Drinking water source after conventional treatment and disinfection	C	- Total Coliforms < 5000 MPN/100 ml - pH between 6 to 9 - Dissolved Oxygen > 4 mg/l - BOD ₅ < 3 mg/l
Propagation of wildlife and fisheries	D	- pH between 6.5 to 8.5 - Dissolved Oxygen > 4mg/l - Free Ammonia (as N) < 1.2 mg/l
Irrigation, industrial cooling, controlled waste disposal	E	- pH between 6.0 to 8.5 - Electrical conductivity at 25°C micro mhos/cm max. 2250 - Sodium absorption ratio max. 26 - Boron max. 2 mg/l
	Below-E	Not meeting A, B, C, D, & E criteria

(Schellenberg et. al. 2020)

Guidelines to Regulate Groundwater Extraction in India

The screenshot shows the website of the Central Ground Water Authority (CGWA). The main heading is "Guidelines to Regulate Groundwater Extraction in India". Below the heading, there is a navigation menu with options: Home, Guidelines, Archival, Contact Us, and Order/Notices. The "Guidelines" section is active, displaying a list of guidelines with "View" links:

- Guidelines for Bulk water suppliers
- Guidelines for abstraction of saline ground water
- Guidelines to regulate and control ground water extraction in India (24-Sep-2020)
- NBC norms for estimation of water requirements for drinking and domestic use.

At the bottom of the page, there is a URL: <https://cgwa-noc.gov.in/landingpage/guidelines.htm>. On the right side, there is a section for "भारत कर्त राजपत्र The Gazette of India" with publication details.

So, again in this image. You can see the designated best-use class of water and criteria for CPCB here. So, you can see that you have a class of water A, B, C, D, and E and what are the criteria used? On the left-hand side, you can see designated best uses like which ones are for drinking water, and which are for outdoor bathing and drinking water purposes. And then for the Wildlife and Fisheries and irrigation industrial cooling control waste disposal. So, we also have center guidelines on groundwater use prescribing penalties for extraction water without permission, and for other offenses link is also provided to you.

So, you can also see here these are the guidelines available. You can also see standards for wastewater from domestic and industrial sources. So, how does that have to be handled?

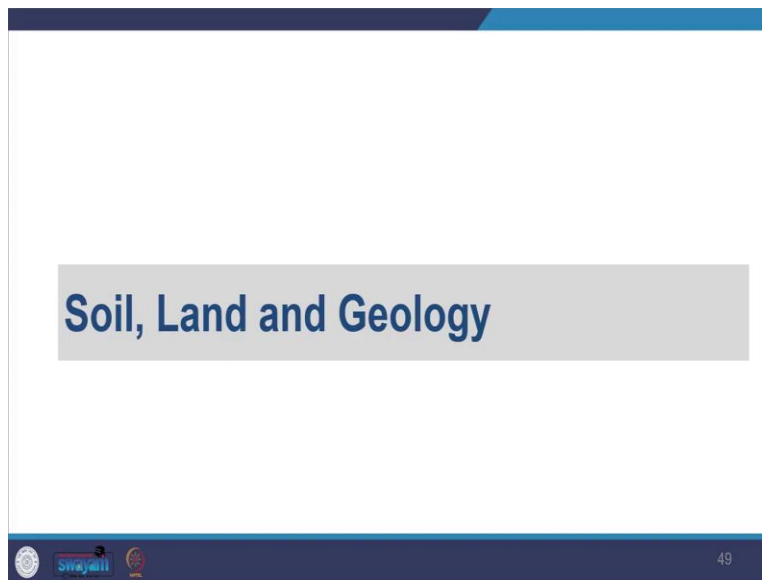
(Refer Slide Time: 15:39)

- Low-Flow Periods
- Flood Standards
- Method -Instream Flow Incremental Methodology

These are especially for the case of Low-Flow Periods as well as for the flood standard. So, when there are Low-Flow Periods where there is less water in the river, and then the flood standards and that time what has to be taken care of, and when we look at Low-Flow Periods what does that mean? It is like flow may be required, a specific flow may be required in a stream or a river to support aquatic fauna, like whatever is there and flora.

And one method if you look at the method for calculating it is like flow, Instream Flow incremental methodology, which is there, so, the Low-Flow Periods is specified. And then also as per the flood standards, you have to see this. So, that was about the water and you have seen what kind of acts and all kinds of guidelines which are they are related to water. So, when you do prepare EIA, and when you study then you might have to for your baseline assessments and all these you have to refer to these.

(Refer Slide Time: 16:38)



So, now moving on to Soil, Land, and Geology. So, in this, we will see the key policy legislation in this domain. So, concerning the protection of geology, there are limited policy interventions, and we do not see many, policy interventions. So, the very first initiative to protect the geological significant areas with such, which sustain biodiversity was taken in USA 1906. And then later we see the UK, which took the initiative in 1949 through the National Parks and Access to the Countryside Act, then we see IUCN International Union for Conservation of Nature, in their fifth World Conservation Congress in 2012.

At the international level, geological heritage was formally recognized. So, they recognized it and addressed it in the Fifth World Conservation Congress in 2012.

(Refer Slide Time: 17:48)

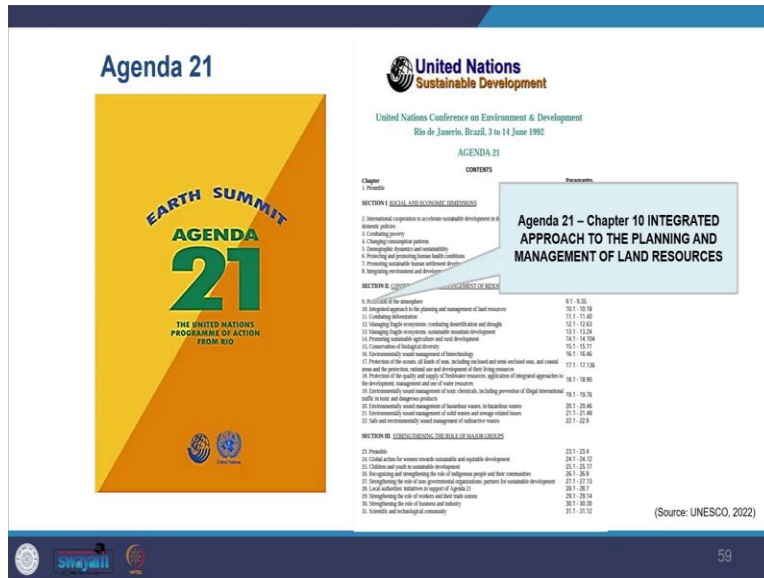


And then, we also see UNESCO in collaboration with IUCN prepared inventories for the Global Geosite Programme, and other regional and international sites of geological interest. So, you can see all this information and the link is also provided to you if you want to visit this. So, we also find UNESCO Global Geoparks which are like places of geological significance at the international level. And we see that 195 member states have ratified this in 2015.

And then now we see 120 parks from 33 countries which are there. So, whenever you do EIA you have to take note of all these things, they are important for the conservation protection, and management of the fossils and stratigraphy, minerals, or other geological interests. So, all these things have to be taken care of, and Geoparks have scientific and amenity value. So, a lot of research also goes there.

So, that has to be acknowledged there. And, one also needs to see the exposure of value to the wildlife like all these have to be checked here. So, you see that many countries have laws and regulatory procedures for the protection of land. And particularly if development displaces soil, so any development like if you are changing, from forestry to agriculture, you are going to change the landform then if you are changing from agriculture to urban, you are going to change the soil form. So, many countries have laws regulations, and procedures for that. So, here we briefly consider the wider international agenda set by the United Nations. So, that you may see here.

(Refer Slide Time: 19:39)



So, you have Agenda 21, which we talked about earlier also. So, it came up from the 1992 Earth Summit Conference on Environment and Development in Rio de Janeiro, Brazil. So, it is in the UN action plan for voluntary implementation by multilateral organizations and individual governments to implement that. So, Agenda 21 is concerned with programs to integrate Environment and Development to achieve sustainable development we have seen that for land and soil, Agenda 21 has several objectives, which are concerned like you can see including management of land resources and fragile ecosystems, how do you manage that combating deforestation, desertification and promoting sustainable agriculture? So, all these are covered in Agenda 21. So, we also see Sustainable Development Goals, which are linked with soil land, and this so you see that sustainable development goals 2, and 12 are all these are connected. You also see sustainable development goals 15.

So, Sustainable Development Goal 2 talks about Sustainable Agriculture, like how that has to be taken care of. So, it also deals with land soil, then you also see SDG 12 on sustainable consumption and production patterns. So, how you are going to use the resources, sustainable management, and efficient use of natural resources?

(Refer Slide Time: 21:14)

Sustainable Development Goals 15 (UN 2015)

15 LIFE ON LAND

THE GLOBAL GOALS
For Sustainable Development

(Source: UN, 2022)

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Soil Thematic Strategy (EC 2006)

REPORTS OF THE
TECHNICAL WORKING GROUPS

ESTABLISHED UNDER THE THEMATIC STRATEGY
FOR SOIL PROTECTION

VOLUME - II

EROSION

Editors

Lieve Van-Camp, Benilde Bujarrabal
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Senthil-Kumar Selvaradjou

2004

EUR 21319 EN/2

(Source: EU, 2022)

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Then you see SDG 15, sustainable use of terrestrial Ecosystems. And then it has like targets, like how you are ensuring conservation, how you are promoting implementation of sustainable management of forest and how you are going to reduce deforestation at the same time, how you are going to handle desertification.

How you are going to restore the damaged land and soil, and how you are going to integrate the entire ecosystem and biodiversity value in the national local planning and development processes. So, how there has to be done? So, that target is set in SDG 15. Further, we see that when we review, the European Union, and the UK.

So, you see that the European Union Commission adopted a soil thematic strategy and a few European member states have specific legislation on soil protection. Then you also see DEFRA, which is the Department for Environment, Food and Rural Affairs. So, they also set up governments approach to how they are going to handle sustainable use and protection of the soil. So, those things are there.

So, whenever EIA is prepared, they all have to be referred. And then this particularly introduced the concept of protecting soil function. So, how the soil function can be protected? And it is so that it can contain the function which it is required to in terms of the vegetation, habitat, and all that it supports. So, it is valuable concerning a wider range of environmental objectives, not just protecting the soil, but then protecting the entire ecosystem.

And then you also see the National Planning Policy Framework, which provides protection of good quality agricultural land within land use planning systems. So, that also needs to be taken care of. Then you find several annexures in European EIA directives, which are concerned with this, which guides on natural resources, particularly with soil, land and water, and biodiversity, and how those things have to be incorporated and taken care of.

(Refer Slide Time: 23:36)

UK Comprehensive Guidance on Soil handling for Land Resources

HS2
HIGH SPEED TWO
PHASE 2a INFORMATION PAPER

E1g: SOIL HANDLING FOR LAND RESTORATION

This paper outlines how HS2 Ltd intends to conserve soils displaced by the construction of Proposed Scheme and subsequently use them for the restoration of land for agriculture, forestry, landscape planting and ecological habitat creation and translocation.

It will be of particular interest to those potentially affected by the Government's proposals for high speed rail.

This paper was prepared in relation to the promotion of the High Speed Rail (Great Midlands) (Crossed) Bill which is now enacted. It was finalized at Royal Assent and no further changes will be made.

If you have any queries about this paper or about how it might apply to you, please contact the HS2 Helpdesk in the first instance.

The Helpdesk can be contacted:

by email: HS2helpdesk@hs2.org.uk

by phone (24hrs): 0800 334 434
0800 448 448 (toll-free)

or by post: High Speed Two HS2 Limited
1 Snowhill, Queenway
Birmingham
B4 6QA

Version 1.2
Last updated: 25 February 2022

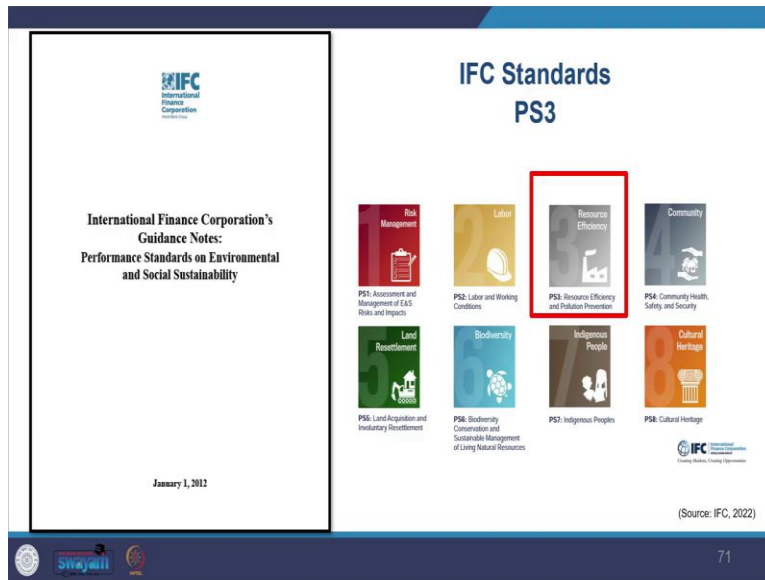
(Source:UK.gov.in, 2022)

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You will also see the UK has Comprehensive Guidelines and guidance on Soil Handling for land restoration. So, when you need to restore the land, how you are going to do so, will be all useful when you are handling and preparing mitigation. So, concerning contaminated lands, you need to in your EIA process, you need to document everything like what will be the receptor.

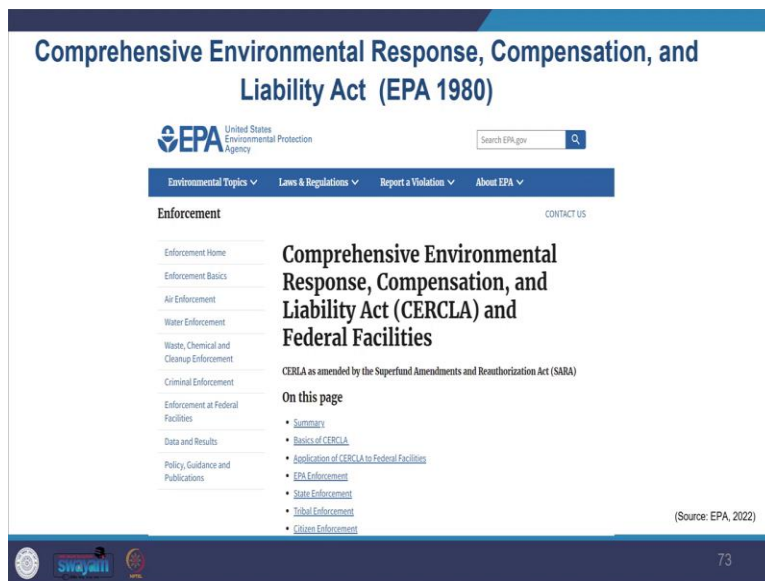
Where what level of contamination is there and how what kind of changes would happen on the receptor? So, all those things have to be provided. And they can overlap between like, how the contamination is happening and how this, mitigation would be done. So, you need to take care of all those aspects here.

(Refer Slide Time: 24:26)



Further IFC performance standards also provide you with all the like pollution prevention within PS3. So, how the clients are required to avoid the release of pollutants, and if avoiding is not possible, then how they are supposed to minimize it? So, all those guidelines are provided.

(Refer Slide Time: 24:49)




In the United States, you will see that there is legislation relating to land contamination, which was introduced through the Comprehensive Environmental Response Compensation and Liability Act. And then you also see specific legislation on contaminated land in other countries which was followed like land quality management.

It was provided in other 14 countries and you also see IFC performance standards and GIIPP standards which are like good international practices, you can see. So, those are provided here.

(Refer Slide Time: 25:31)

Queensland - Contaminated Land Act, 1991

Queensland



Contaminated Land Act 1991

Act No. 96 of 1991

An Act to facilitate the management of contaminated land and for related purposes

[Assented to 11 December 1991]


(Source: FAO, 2022)

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Contaminated Land Management Act 1997, New South Wales

Contaminated Land Management Act 1997 No. 140 (2024)

New South Wales



Contents

Long title

Part 1 Preliminary

- 1 Name of Act
- 2 Commencement
- 3 Objects of the Act
- 4 Definitions
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- 6 Responsibility for contamination of land
- 7 Concept of natural cause
- 8 General Exemption (GEX)
- 9 Need to maintain ecologically sustainable development

Part 2

Part 3 Management of contaminated land

Division 1 Preliminary investigation of land

- 10 Preliminary investigation orders

Division 2 Regulation of significantly contaminated land

- 11 Declaring land to be significantly contaminated land
- 12 Matters to be considered before declaring land to be significantly contaminated land
- 13 Choice of appropriate person to be made subject to management order
- 14 Management orders
- 15 Details of management order
- 16 Actions that may be required by management order
- 17 Recovery management expenses
- 18 27 (Repealed)

Division 3 Ongoing maintenance of management action

- 19 Ongoing maintenance orders
- 20 Ongoing maintenance—notifications and comments

Division 4 Action by public authority

Current version for 8 January 2019 to date (accessed 26 June 2019 at 03:15) Page 2 of 72

(Source: FAO, 2022)

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And then you can also see Australia and the UK have also had their laws in place. You also find legislation in the UK dealing with contaminated land, which relies on the principle of suitable for use approach where you look Act the remedial action has to be provided and only if there is an unacceptable risk to the health property, or environment.

So, you can see guidance and planning policy documents in the UK the range of documents which are there, Environmental Protection Act of 1990 then statutory guidelines National Planning Policy Framework guidance, Communities and Local Government, guidance on land affected by contamination, communities and local government. Again, you see 2014, Water Act 2003.

Then you also see Scotland and all the planning policies which are there and there and then you also see Northern Ireland where they provide this. So, this list is given to you can refer to them just for your information here. So, in the UK, you see the planning and pollution control systems are separate, but they complement the entire Act process.

(Refer Slide Time: 26:50)

Land, Soil and Geology covered under the Various Acts and Rules

POLLUTION CONTROL LAW SERIES
PC/LAW/201-202

PART-III

POLLUTION CONTROL ACTS, RULES & NOTIFICATIONS ISSUED THEREUNDER

CPCB

CENTRAL POLLUTION CONTROL BOARD
(Ministry of Environment, Forest & Climate Change, Government of India)
Parliament Building, New Tughlakabad, Delhi - 110002
Website: <http://www.cpcb.in>
April, 2021

1	The Environmental Protection Act, 1986 (as amended to date)	151	12	Central Regulation Zone (CRZ) Notification (as amended to date)	464
2	Notifications under the Environmental Protection Act, 1986	161	13	Environment Impact Assessment Notification, 2006	524
	(i) Powers to Grant Recognition to Environment Laboratories and Government Analysts	162	14	The Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 (as amended to date)	621
	(ii) Officers Authorized for taking Cognizance of Offences	185	15	The Manufacture, Use, Import, Export and Storage of Hazardous Micro-Organisms (Genetically Engineered Organisms or Cells) Rules, 1989	681
	(iii) Officers/Agencies Empowered for Entry and Inspection	187	16	The Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 (as amended to date)	704
3	The Environmental Protection Rules, 1986 (as amended to date)	248	17	The Bio-Medical Waste Management Rules, 2016 (as amended to date)	749
4	SCHEDULE I: Standards for emission or discharge of environmental pollutants	250	18	The Solid Waste Management Rules, 2016 (as amended to date)	787
5	SCHEDULE II: (Omitted)	372	19	The Batteries (Management and Handling) Rules, 2001 (as amended to date)	827
6	SCHEDULE III: Ambient Air Quality Standards in Respect of Sites	373	20	The E-Waste (Management) Rules, 2016 (as amended to date)	844
7	SCHEDULE IV: Standards for Emission of Smoke, Vapor, etc. from Motor	373	21	The Plastic Waste Management Rules, 2016 (as amended to date)	880
8	SCHEDULE V: Statutory Authorities or Agencies	378	22	The Construction and Demolition Waste Management Rules, 2016 (as amended to date)	896
9	SCHEDULE VI: General standards for discharge of environmental pollutants	380	23	The Noise Pollution (Regulation and Control) Rules, 2000 (as amended to date)	910
10	SCHEDULE VII: National Ambient Air Quality Standards	396	24	The Ozone Depleting Substance (Regulation and Control) Rules, 2000 (as amended to date)	916
(1)	Notification under the Environmental Protection Rules, 1986 (as amended to date)		25	The Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996 (as amended to date)	976
	(i) Prohibition on the location of all industries in Mandla-Injara Area in Raigarh District of Madhya Pradesh	398	26	Scheme on Labeling of Environment Friendly Products (Eco-Mark) (as amended to date)	1009
	(ii) Restrictions on location of industries, mining operation and other development activities in Deosai Valley in Jammu Pradesh	399	27	The Regulation of Lead Contents in Household and Domestic Paints Rules, 2016 (as amended to date)	1016
	(iii) Prohibition and restriction on the handling of Hazardous Substance in different Cases.	406	28	The Regulation of Polychlorinated Biphenyls Order, 2016	1018
	(iv) Prohibition on the handling of Analyses.	407	29	The Wetlands (Conservation and Management) Rules, 2017 (as amended to date)	1023
	(v) Prohibition Of Storage Of Chemical in Ampy Hill in Bombay.	410	30	The Regulation of Persistent Organic Pollutants Rules, 2018	1032
	(vi) Restrictions on the setting up of industries in Dahisar Taluka, District Thane, Maharashtra.	414			
	(vii) Restrictions certain activities in Specified area of Anavadi Range.	421			

(Source: CPCB, 2021)

Highway Projects in Hilly Areas – Checklist for Erosion Control

Highway Projects in Hilly Areas - Checklist for Erosion Control

Does the road construction projects estimate provide for the necessary measure against soil erosion?	
Have soil maps and aerial photographs studies and investigations been made to locate areas or sections with high erosion potential?	
Has erosion potential been considered for each alignment?	
Have geological maps been studied or local geological department consulted to avoid unstable strata? Does the selected alignment follow the lie of the land and avoid large-scale cutting?	
Has use of tunnels to avoid deep cuts been investigated?	
Is the road alignment suspect to damage/erode by streams and torrents?	
Is consultation/co-ordination with other departments like forest department necessary? If so, have they been consulted?	
How will adjacent and nearby streams, ponds and lakes be affected by project construction?	
Does the road cross section involve a lot of disturbance to the natural ground?	
Are the designs cut slopes stable for the type of areas?	
Are slope-stabilizing structures like breast walls, pitching etc. required?	
Does the cut hill face require any special treatment to prevent slips?	
Has the area of clearing and grubbing been clearly demarcated?	
Has a work schedule been worked out for the different construction operations?	
What erosion control works are required before clearing and other works are started?	
Are any temporary erosion control measures required between successive construction stages?	
Have well-wooded strips, benches, catchwater drains, ditch paving, slope protection works and other erosion control items been identified on the plans and provided in the proposals?	
Have the location and alignment of culverts been fixed with due consideration to erosion at sections and situation at inlets?	
Have the necessary erosion control measures been taken at the outfalls of culverts?	
Has the proper disposal of surplus excavated material been thought of and provided for?	
Do any of the design measures require modification in the light of field conditions?	

(Source: CPCB, 2021)

In this image, you can see the Pollution Control Act Rule and notification mentioned in the pollution control law report by CPCB you can find guidelines related to land, soil, and geology mentioned in this report, all the rigid acts and rules are highlighted here in red color box. So, you can see all of these are concerning in part three is concerning with, land, soil, and geology in the Indian context.

So, in the report Environmental Impact Assessment Guidance Manual, Ministry of Environment Forests Government of India, you see that under the highway section for protection and land and soil, they have mentioned the checklist for erosion control for highways. So, what are all the things you need to take care of? So, you can see highway projects in hilly areas, the checklist for erosion control is mentioned when you are developing highway projects here.

So, questions like does the road construction project estimate provides necessary measures against soil erosion have soil maps and aerial photographs studied, and investigations have been made to locate areas or sections

with high erosion potential. So, all these things have to be seen here. So, in further you see that similarly, they have also mentioned the guidelines for geological data for measurement of assessment purposes.

(Refer Slide Time: 28:21)

Tables of Standards

Annexure 4.1 Hydraulic Conductivities of Soil

S.No.	Soils	K-values (m/ day)
1	Clay surface	0.01-0.2
2	Deep clay layer	10 ⁻⁴ -10 ⁻⁷
3	Loam	0.1-10
4	Fine sand	1-5
5	Medium sand	5-20
6	Coarse sand	20-100
7	Gravel	100-1000
8	Sand and gravel	5-100
9	Clay, sand & gravel	0.001-0.1

Source: MoWR, Govt. 2004, pg. 15, 84

Annexure 4.2 Specific Yield of Different Formation

Formation	Yield (%)
Sand :	10-30
Gravelly Sand (coarse sand) :	15-30
Sand and Gravel :	15-25
Sand stone coarse-grained :	10-15
Sand stone fine-grained :	5-15
Thick plastic clay :	3-5
Weathered rock :	2-5
Clay :	1-10
Fractured and jointed rock :	0.50-5

Annexure 4.3 Typical Porosities of soil

Soil Texture	Porosity
Sandstone	0.19
Sandy loam sub soil	0.36
Sandy loam plough layer	0.42
Clay loam subsoil	0.44
Recently ploughed clay loam	0.58

Source: Manual on norms and standards for EC of large construction projects-MoEF
(Source: CPCB, 2021)

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So, as you can see in the table of standards that you can see hydraulic and conductivities you can see the Specific Yield of different soil formations then you can also see typical porosities of soil. So, you can see here, so, these are all guidelines and standards provided while you work for EIA, you need to align them, and abide by them.

(Refer Slide Time: 28:45)

Guidance for assessment of representativeness and reliability of baseline environmental attributes

Attributes	Sampling		Measurement Method	Remarks
	Network	Frequency		
D. Land Environment				
Soil	One surface sample from each village; (soil samples be collected as per BIS specifications)	Seasonwise	Collected and analysed as per soil analysis reference book, M.L.Jackson and soil analysis reference book by C.A. Black	
} Particle size distribution				
} Texture				
} pH				
} Electrical conductivity				
} Cation exchange capacity				
} Alkali metals				
} Sodium Absorption Ratio (SAR)				
} Permeability				
} Water holding capacity				
} Porosity				

(Source: CPCB, 2021)

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Guidance for assessment of representativeness and reliability of baseline environmental attributes

Land use/Landscape	At least 20 points along the boundary	Global positioning system	
} Location code			
} Total project area			
} Topography		Topo sheets	
} Drainage (natural)		Satellite Imageries* (1:25,000)	
} Cultivated, forest, plantations, water bodies, roads and settlements		Satellite Imageries* (1:25,000)	
		*Project specific	

(Source: CPCB, 2021)



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You can find the different attributes of land and land use environmental data concerning their sampling frequency and network and measurement methods. So, that is also provided by the ministry here. So, these guidelines are provided so you can see the attributes of the sampling measurement methods and how you have to take them.

So, you can see the land environment within that soil what all the things you have to take care of particle size, distribution, texture, pH, electrical conductivity, and then how you have to take sampling so if you are doing network sampling one surface sample from each village has to be taken and then frequency season wise and like every for every season it has to be taken and how you are going to measure that so collected and analyzed as per soil analysis reference.

So, which book you are going to refer to that all have been given? Likewise, you see how you have to take care of land use and landscape. So, you have to provide the location code, and total project area and you have to look into topography, and drainage, all these have to be seen, and then at least 20 points along the boundaries. So, you need to as per the norms, you have to take 20 points along the boundary. And then measurement can be GPS Global Positioning System, the Topo sheets, and how you can use satellite imageries and it might vary with project specification. So, that is what we saw today.

(Refer Slide Time: 30:10)

Summary

- 1 **Water**
 - i Key Concepts of Water
 - ii Key Legislation, Guidance and Standard for Water
- 2 **Soil, Land and Geology**
 - i Key Legislation, Guidance and Standard for Soil, Land and Geology

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So, summarizing, this particular session, we saw that water, we looked into the water, key considerations, and then the legislations associated with that and what references do we follow in the Indian context? Then we saw soil land and geology and then what are the key legislation and what kind of references we follow here. So, that was for today.

(Refer Slide Time: 30:35)


References

- 1 Therivel, R., & Wood, G. (2018). Methods of Environmental and Social Impact Assessment. <https://ccn.loc.gov/2017010184>
- 2 Asrar, G. R., Lucas, P., van Vuuren, D., Pereira, L., Vervoort, J., & Bhargava, R. (2019). Outlooks in geo-6-Source: Global Environment Outlook (GEO-6): Healthy Planet, Healthy People
- 3 Environmental Impact Assessment Training Manual EIA Online Learning Platform www.iisd.org/learning/eia. (2014). www.iisd.org/learning/eia
- 4 United Nations Environment Programme (UNEP) (2002) Environmental Impact Assessment Training Resource Manual Second edition

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Suggested Watch and Read

<https://www.youtube.com/watch?v=zBKGuuxFnTE>



Water Pollution Effects on the Environment


<https://www.youtube.com/watch?v=HcY-IFSYZM>



SOIL POLLUTION: A HIDDEN REALITY

Soil Pollution, a hidden reality

<https://www.youtube.com/watch?v=eZZ-ECSFgA>





Water Quality and Future Generations: Deb Swackhamer at TEDxUMN


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These were the references that we used for this particular session. So, you can go and read them, and also like all the links that have been provided, you can see them as well. These are the suggested watches and read for this particular segment.


(Refer Slide Time: 30:52)

? Please feel free to ask Questions. 

Let us know about any Concerns you have 

 Do share your Opinions, Experiences and Suggestions

Looking forward to Interacting and 

Co-learning with you while exploring EIA 

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Please feel free to ask questions. Let us know about any concerns you have. Do share your opinions, experiences, and suggestions, looking forward to interacting and co-learning with you while exploring EIA. Thank you.