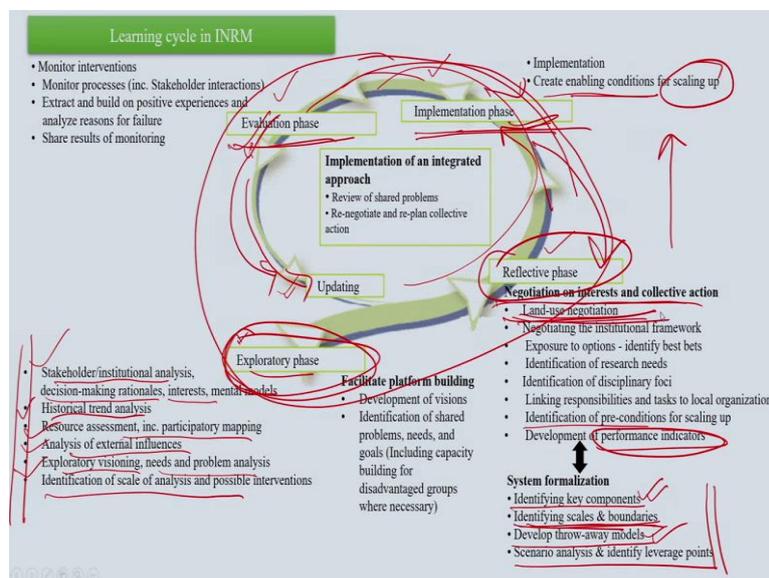


**Natural Resources Management (NRM)**  
**Professor Sudip Mitra, PhD**  
**Centre for Disaster Management & Research (CDMR)**  
**Head, School of Agro & Rural Technology (SART)**  
**Discipline - Agriculture Engineering**  
**Indian Institute of Technology, Guwahati, India**  
**Week - 03**  
**Lecture - 16**  
**Learning Cycle in Integrated Natural Resources Management**

Now, we will discuss about the Learning Cycle of Integrated Natural Resource Management,

(Refer Slide Time: 0:33)



Let us see that what are the components of INRM learning cycle. So, it start with the exploratory phase, then reflective phase, implementation phase, evaluation phase and finally, updating phase. Now, I will discuss about each phase and what are the activities actually in this learning cycle of INRM, we need to carry out.

Let us start with the first one exploratory phase. From the name itself, it is clear that at the exploratory phase, we will be interacting with the community, different stakeholders, people working at the ground level. So, what we do need, we need to have a stakeholder or institutional analysis in the exploratory phase.

Now, decision making kind of rationales, interests, mental models, all those exercises will be carried out at the exploratory phase. Then comes the important aspect; historical trend analysis. How over a period of time in this particular area for different natural resources, how it worked over a period of time, then resource assessment including participatory mapping,

which we have discussed in the previous classes in quite detail, analysis of external influences, how different external influences like say, some policy decision at the government level, then any change in the political discourse, then in flow of investment into that area, demand of resources for different product development, there are many aspects actually involved.

So, exploratory visioning needs and problem analysis is also part of your first phase exploratory phase. Identification of scale of analysis and possible interventions. So, these are the particular activities, which we largely carry out at the exploratory phase. Then comes the next in reflective phase, what we do is that, we try to negotiate on the interests and of the community and we try to somehow, generate a kind of a sense of a collective actions at the ground level. So, negotiation for land use, suppose that in one area, suppose one natural resource are utilized or exploited in a regular interval and across the all seasons.

So, naturally those particular natural resources will get diminished and very fast from that ecosystem or that particular area. So, we need to somehow create a kind of awareness among the community that how best that they can manage their land use system, so, that a particular natural resources should not be utilized in such extensive manner, that before it gets rejuvenated through natural process, we finish it completely.

Say for an example, cultivation of certain crop which suppose requires huge amount of water. And now, suppose in an area where rainfall is not that much say medium or less rainfall, but you are growing a crop, which is demanding high amount of water. Now, you are growing that probably provides the grain or food which is staple for you. So, it is very difficult to change suddenly that. But at the same time, that requires huge amount of water and water is a scarce natural resource in your area. So, what would be the sustainable solution for that? The sustainable solution probably could be that you have a balance in your land use instead of growing that particular water demanding heavy water demanding crop continuously, probably you can have a crop mix, which all has less water demand.

So, during that period when you growing the less water demanding crops, you can actually concentrate or focus on enhancing or recharging the water base in that particular area. So, that could be one way actually to address these issues. So, then exposures to various options, identify the best options that you can have, identify research needs for solving certain issues problem in an area, then linking responsibilities and task of local organization. When you go to the field, you will see that in any area, there are various local organization, some of them

are working suppose on water, some of them are working on soil, some are working on crop diversity, few are working on dairy, so, I mean a lot of things.

Now, it is important that all these local grass root level organizations, they work at least in kind of a harmony because these are all different livelihood options in an area are very much interlinked to each other. So, you will find that you opt for one livelihood and suppose one organization is working towards that and they are encouraging that particular livelihood. Whereas, the other livelihood option probably, the organization who are working not that much aggressive. So, what happened is that, that one particular livelihood options start getting developing very fast. So, the raw materials required for that particular livelihood options will be much higher.

So, important is that these are all different livelihood options and so, the organizations who are working with this should work in harmony because that is the best way to manage your natural resources. And, and that is the way that is also the part of integrated natural resource management. So, identification of preconditions for scaling up of any activities that also one needs to identify. Suppose that your area is having some scarcity of water. So, you need to go for say groundwater recharging. So, what do you have to do, you will go for some technical interventions there.

So, when you go for those technical interventions, suppose to recharge your groundwater, you need to also see certain preconditions, whether your interventions for recharging of groundwater should not lead to another problem. So, checking of preconditions for any of your intervention for the good of that particular area also need to be checked.

Now, development of performance indicator, it is very important. Suppose, we are working in an area for months and years, but there is no way that we can actually identify that how much we have progressed from point A to point B or point A to minus towards the negative side. So, that you can only do when you have some performance indicator to actually judge the impact of your intervention in a particular area.

So, there are a couple of other aspects also to look after; identifying suppose key components of the system, then scales and boundaries, if you actually go for any kind of strategy, development of planning or any kind of development growth strategy, you need to actually identify the scale of that, the boundaries of a particular, related to particular natural resources. So, one may be different from the other.

So, you are supposing, thinking about water, that could be very much different from another resources suppose soil. So, these things are very important to keep in mind.

Develop throw away models some time, it is important to have some few throw away models also in our hand and then scenario analysis and identify leverage point.

So, whatever conditions that we are working, we also need to find out that suppose that there is a change in future, in anticipation of that change, we also need to find out our requirement, the potential requirement of natural resources by the community or the area. So, those futuristics analyses, scenario analysis are also important for a long term plan, which actually could facilitate the sustainable development of a particular area.

Then comes, your implementation phase; all of us we know that implementation of any kind of initiative at the ground level is a big challenge. So, you need to actually have few enabling conditions, to have those particular intervention implemented successfully in an area and not only implement them then to scale up, that is an another challenge, because any intervention in a particular area, it should not be restricted to that particular pocket, it has to go urgently and also vertically.

So, the scale up of horizontal and vertical, it is also needed to be planned and take care of. Implementation phase is also critically important because, that is the phase which will decide that how your intervention, policy intervention, technical intervention actually is going to lead INRM, in which direction sustainable management of natural resources or unsustainable management of natural resources. So, implementation stage is very critical for INRM.

Now, evaluation phase, this phase will actually allow you to find out that whether we have done all the exercise properly. The steps that we have taken are actually beneficial, the policy that has been implemented on the ground are conducive for sustainable use of natural resources.

So, evaluation phase actually will tell us about these things and if we find that we could not do the job in appropriate manner, we should go back, correct our implementation and even if in the implementation, we find that, no, it is even at the negotiation of land use cropping system itself needs to be looked at. So, there is no harm to go back and readjust and then again implement and come back.

Evolution phase also will give lot of learnings, lot of successes and some failures. So, those all those information would help you actually to update your understanding, update your knowledge, and that will actually help a better implementation probably in the next time. So, overall, the learning cycle in case of INRM provide lot of opportunity for actually establishing the sustainable development system.

So, that is why it is important that from the very beginning with the very first phase, that is exploratory phase, we keep few things in mind that is it has to be inclusive, largely equitable, and also a very reflective approach needs to be taken from the very beginning, whatever implementation and whatever work that will be carried out under INRM, we need to see that in which direction finally it will take.

So, reflective phase is very important, because, there you actually try to find out the balance between different land use systems. Everything the demand of natural resources exploitation or even futuristic requirement of natural resources is based largely on the land use, that people will go for.

So, from that point itself, it is very critical, that there is a kind of a balance between various land use and then you will see that the demand for any single natural resources will not be there. There will be some balances and that balance is key for integrated natural resource management.

(Refer Slide Time: 14:15)

**INRM**

INRM plan (INRMP) include the followings

- A description of the installation, its history, and its current mission
- Management goals and associated timeframes
- Projects to be implemented and estimated costs
- Discussion on how military mission and training requirements are supported while protecting the environment
- Legal requirements and biological needs of the natural resources
- The role of the installation's natural resources in the context of the surrounding ecosystem
- Input from the fish and wildlife service, state fish and wildlife agencies, and the general public

Plan

Discussion

INRM plan, so, we call it INRMP, integrated natural resource management plan. So, what does INRM plan contain? It includes a description of the installation, its history and its

current mission, what actually it is doing at present. Next, management goals and associated timeframes, what are the activity will be carried out and within which timeframe that is also important, and it is there under INRM plan. Projects to be implemented and costs should be estimated. So, any project that you are planning to implement the required cost has to be also estimated. Discussions on how military mission and training requirements are supported while protecting the environment.

Now, this is something that is very critical in some parts of our country as well as elsewhere. Now there often it happens that there are certain obvious requirements for different kind of activities for the security of our country. So, for different this kind of obvious needs some time natural resources need to be compromised, not very willingly, but it is kind of situational. Now, that also can be addressed, how we can maximize balance that requirement, that very sensitive requirement of various resources and at the same time to protect the environment.

Legal requirements and biological needs of the natural resources are again another very sensitive issues. Many times you will see that various parts of our content elsewhere in the world, that certain natural resources are very integral part of our society and our family. Now, the biological the needs of those natural resources in our biological system is certain amount of kind of association with our lifestyle, our very existence in some parts or some culture is totally dependent on certain natural resources. You cannot just separate those natural resources from a particular community in certain areas. So, that is also another thing that integrated natural resource management plan should have in their mind.

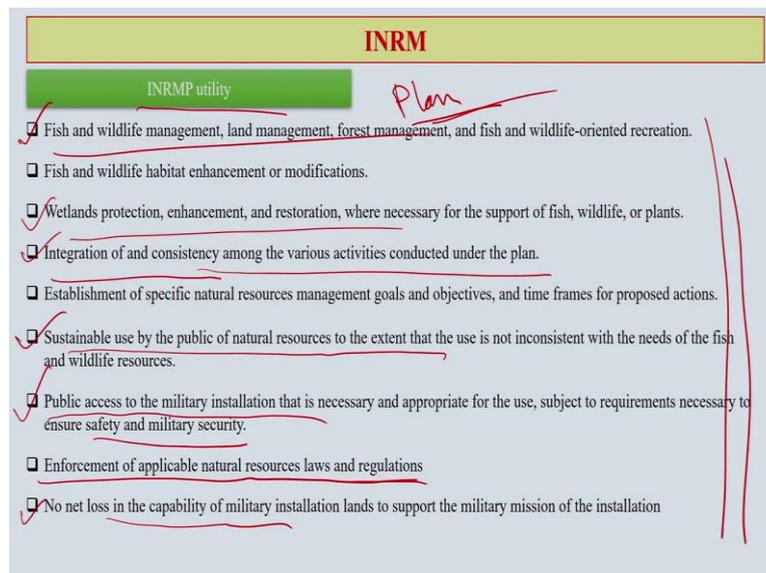
The role of installations or natural resources in the context of surrounding ecosystems is also important. Suppose, you are suddenly building something in an area which is surrounded by very rich biodiversity or maybe full of biomedicinal plants and then you have a installation, which perhaps is very important from a point of view for the human well being itself, but it is also need to be seen that how in the context of that particular ecosystem, in the context of the natural resources that are available in that ecosystem, how they are actually going to get impacted, that also need to be seen.

Now, input from fish and wildlife services, state fish and wildlife agencies and also general public, they also need to be considered in this planning exercise for integrated natural resource management. Lot of people in our country as well as elsewhere, they actually survive on fish and different kind of wildlife services.

Now, if those services are somehow get impacted, probably a huge number of people livelihood will be at stake and I would go one step further, if their livelihood get disturbed then probably the entire dynamics in that particular society could go completely in different directions.

So, it is important from this point of view, that we should have a good plan for integrated natural resource management for an area and these are the different aspect which often becomes very sensitive, so, needed to be considered and discussed and as I said, that discussions, dialogues can solve many seems completely unsolvable problem can be solved also through dialogues. So, that is one aspect that integrated natural resource management encourages us to do.

(Refer Slide Time: 19:27)



What are the utility of these integrated natural resource management plan? If you see that in case of fish and wildlife management, then land management, forest management, fish and wildlife oriented recreation also, INRM plays a very important role. So, fish and wildlife habitat as I said earlier, also, it can be managed in a nice way if we follow the INRM rules. It can actually enhance the associated livelihood to these resources. Wetland protections, I mean, all of you might be knowing that how important is wetland in our ecosystem. So, restoration of wetlands because that wetland actually also support various fish, wildlife and plants. So, that also needs to be there in the plan.

Integration of and consistency among the various activities that actually are conducted under INRM plan also need to be looked at. So, any kind of activities carried out in INRM should

not happen actually in isolation. There has to be a kind of a what do you call one aspect of INRM if it is being carried out; the other aspect also should be equally given importance.

Now, sustainable use of public natural resources to the extent that use is not inconsistent. So, means, as I said couple of minutes back that it is important that balanced use of natural resources like forest, fish, wildlife is very critical.

Public access to certain military installation that is necessary and appropriate for the use, the subject to requirements necessary to ensure safety and military security. Now, this installation of military unit, you will find often in very remote area, inside a forest, suburb sometimes in an area where biodiversity is very rich. So, those areas also need to be kept in the INRM plan that how to adjust that little bit of disturbances due to these installations within that particular ecosystem.

Now, enforcement of applicable natural resources, laws and regulations is very important. How good the different existing law and regulations are being implemented on the ground can actually be crucial for successful implementation of INRM.

No net loss in the capability of military installation lands to support the military mission of the installations also needs to be kept in mind. So, these are couple of utility that INRM plan provides. So, this also needs to be looked at also places where probably some of the constituents are working absolutely in the way it is recommended for, in some areas probably they are not. So, little bit of location wise adjustment probably needed.

(Refer Slide Time: 22:48)

The slide features a light blue background. At the top, there is a green horizontal bar with the text 'INRM' in red. Below this, a blue box contains the text 'INRM constrains of upscaling'. Underneath the blue box, there is a list of three items, each preceded by a square checkbox and underlined with a red line:

- Absence of upscaling strategies of INRM
- Inadequacy in the integration of policy implementation and decision making
- Insufficient evidence-based knowledge for INRM implementation

Constants for upscaling. Often you will find that if you go for integrated natural resource management, you will find that lot of challenges and constraints for scaling up any of your activity or initiative under INRM, some of them are like absence of upscaling strategies of INRM within the area that you are working sometimes create a lot of hurdles for the system to work on INRM.

Adequacy in the integration of policy implementation and decision making could be another constant. Insufficient evidence based knowledge for INRM implementation is one critical constraint that often on the ground you will face it. Evidence based knowledge, because if you just go and ask a community or someone that stopped utilizing these particular natural resources, they may not.

So, we need to have a certain kind of first alternative option for that. Second, that some evidences that if this is the way this particular resource is being used, it could lead to there and if it is used in the other way, it could lead you there. So, this kind of evidence based knowledge often help the practitioners to convince the community or convince the people, the client, who actually are going to be there with this resource base in their community. So, there are couple of more actually constants you will find when you start working at the ground level.

(Refer Slide Time: 24:33)

**Integrated Water Resources Management (IWRM)**

IWRM has been defined as "a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems"

**IWRM framework**

1. **Social equity:** ensuring equal access for all users (particularly marginalized and poorer user groups) to an adequate quantity and quality of water necessary to sustain human well being
2. **Economic efficiency:** bringing the greatest benefit to the greatest number of users possible with the available financial and water resources.
3. **Ecological sustainability:** requiring that aquatic ecosystems are acknowledged as users and that adequate allocation is made to sustain their natural functioning.

Integrated Water Resource Management; water is one of the natural resources and IWRM is also is a very popular concept. IWRM has been defined as a process which promotes the coordinated development and management of water, land and related resources, in order to

maximize the resulting economic and social work welfare in an equitable manner without compromising the sustainability of vital ecosystem. So, the key word as you find here, coordinated development, equitable manner, sustainability of vital ecosystem, so, more or less it IWRM is also working with the same philosophy as INRM.

IWRM framework, how actually it is, based on, first social equity, it ensures equal access for all users to the water, an adequate quantity and quality for a sustainable well being that is a social equality as IWRM prescribes. Economic efficiency, why? Bringing the greatest benefit to the greatest number of users possible with the available financial and water resources. So, the maximizing the benefit with the available water resources to the people; that is what is the economic efficiency.

Ecological sustainability, requiring that aquatic ecosystems are acknowledged as users and that adequate location is made to sustain their natural functioning means that we need to give proper value to the water as a resources and we also as an users, we need to acknowledge that this particular natural resource water, if you want them to be available in the coming years and decades in a particular area, so we need to manage them in a very judicious manner. So, aquatic system management with ecological sustainability mind frame is also critical for its best management.

So, with this, we actually conclude the integrated natural resource management concept, its philosophies, its functioning, its different frameworks, how it works, different constraints, its life, learning of life cycle of particularly INRM, how it works, what are the different phases. So, overall that integrated natural resource management is an kind of umbrella that actually provide us how actually we should behave or how we should actually take care of the natural resources, which are the very fundamental basis of our existence, our sustainable development, or sustainable wellbeing.