DEVELOPING PLAN AND ECONMICS:

Formulating a comprehensive reservoir management plan is essential for the success of project see figure (6).

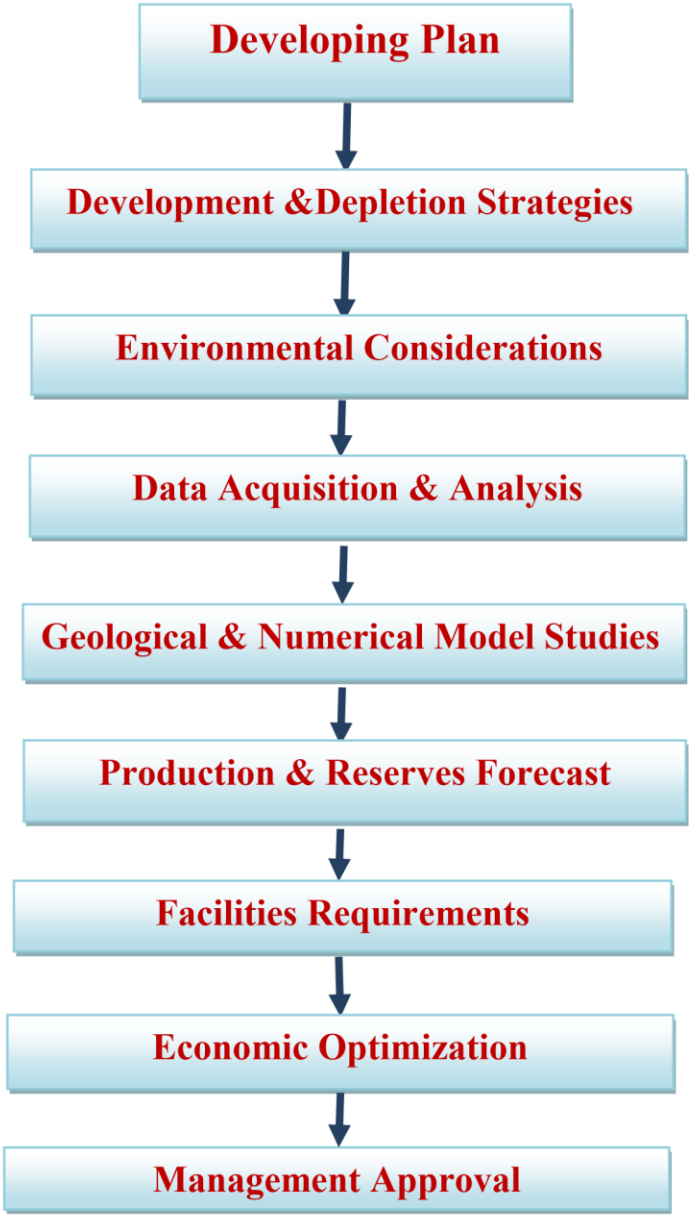


Figure (6): Developing Plan

Development and Depletion Strategy:

The most important aspect of reservoir management deals with the strategies for depletion the reservoir to recover petroleum by primary and applicable secondary and enhanced oil recovery methods. Development and depletion strategies will depend upon the reservoir's life stage. In case of new discovery, we need to address the question of how to best develop the field (i.e., well spacing, number of wells, recovery schemes, primary, and subsequently secondary and tertiary), if the reservoir has been depleted by primary means, secondary and even tertiary recovery schemes need to be investigated.

Data Acquisition and Analysis:

Reservoir management starting from developing a plan, implementing the plan, monitoring and evaluating the performance of the reservoir, requires a knowledge of the reservoir that should be gained through an integrated data acquisition and analysis program, Figure (7) shows a list of data needed before and during production. Data analysis require a great deal of effort, scrutiny and innovation. The key steps are:

1. Plan, justify, time, and prioritize.

2. Collect and analyze

3. Validate / store (data base)

Geological and Numerical Model Studies:

The geological model is derived by extending localized Core and Log measurements to full reservoir using many technologies, such as geophysics, mineralogy, depositional environment and digenesis. The geological model, particularly the definition of geological units and their continuity and compartmentalization, is an integral part of geostatistical and ultimate reservoir simulation models. Figure (8) shows a sample of geological model.

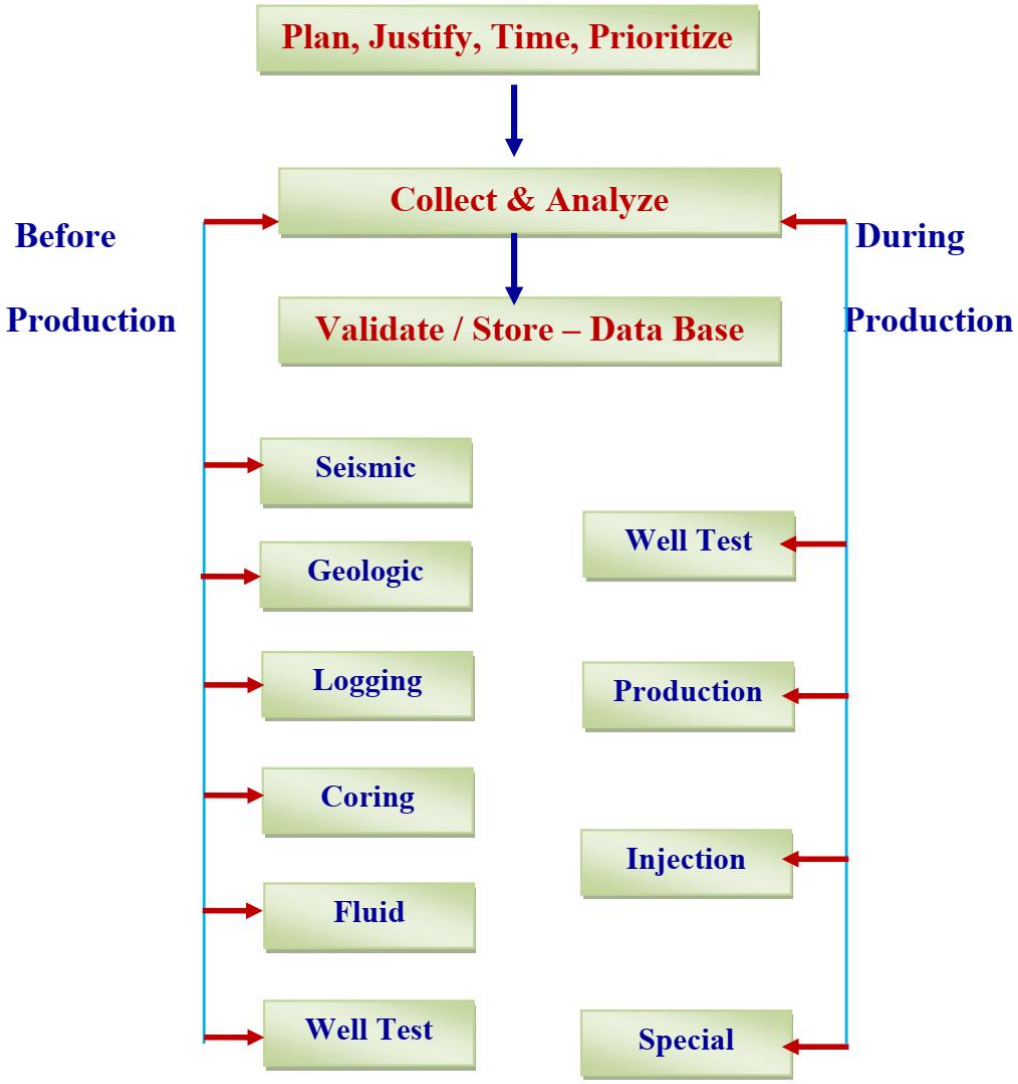


Figure (7) Data Acquisition & Analysis

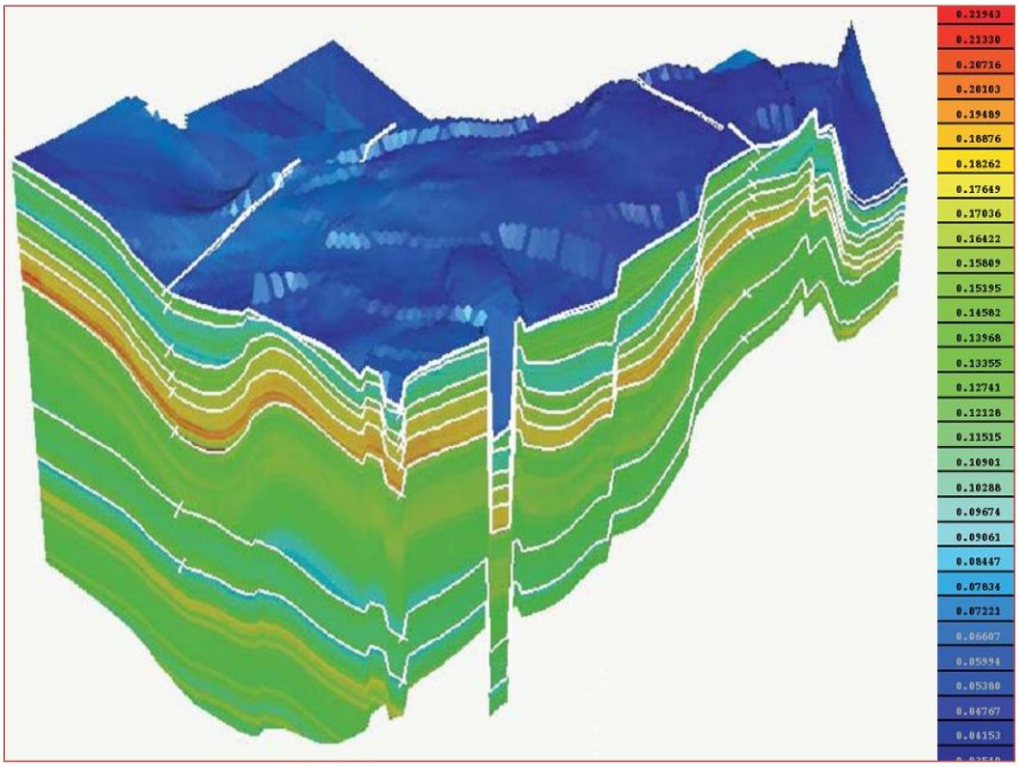


Figure (8) Geological Model

Production and Reserves Forecast:

The economic viability of a petroleum recovery project is greatly influenced by the reservoir production performance under the current and future operating conditions. Therefore, the evaluation of past and present reservoir performance and forecast of its future behavior is an essential aspect of the reservoir management process (Figure 9). classic volumetric, material balance, and decline – curve analysis methods, and high technology black oil, compositional and enhanced oil recovery.

The numerical simulator is used for analyzing reservoir performance and estimating reserves. Reservoir simulators play a very important role in formulating initial development plans, history matching and optimizing future production and planning and designing enhanced oil recovery. Figure (10) shows different type of modeling.

The reservoir simulation defines as the process of mimicking or inferring the behavior of fluid flow in a petroleum reservoir system through the use of either physical or mathematical models.

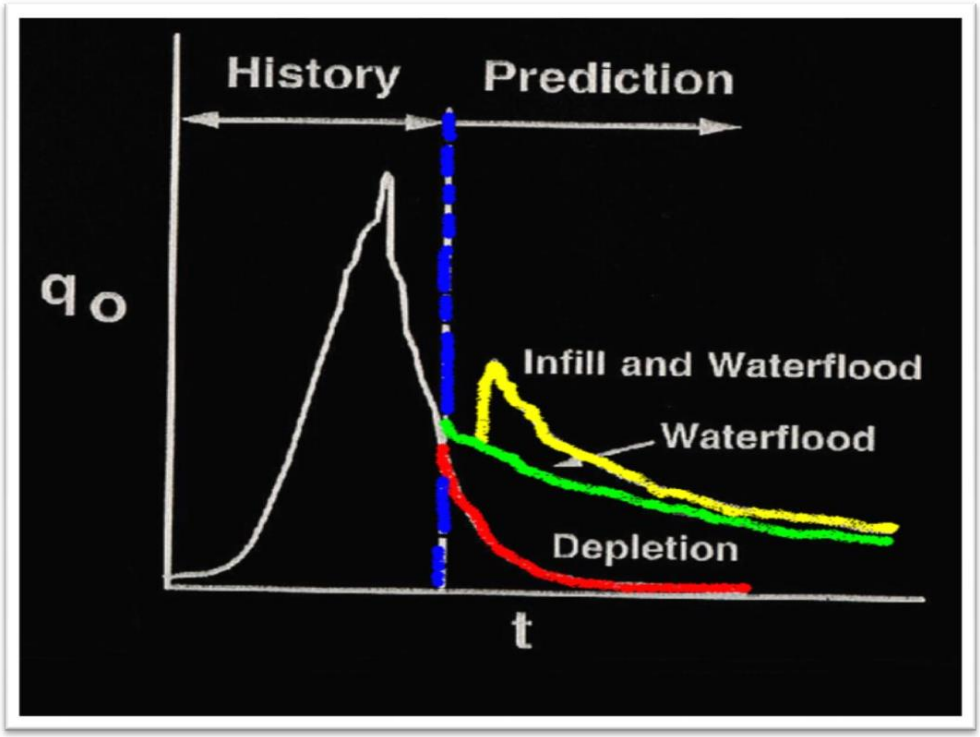


Figure (9) Production history

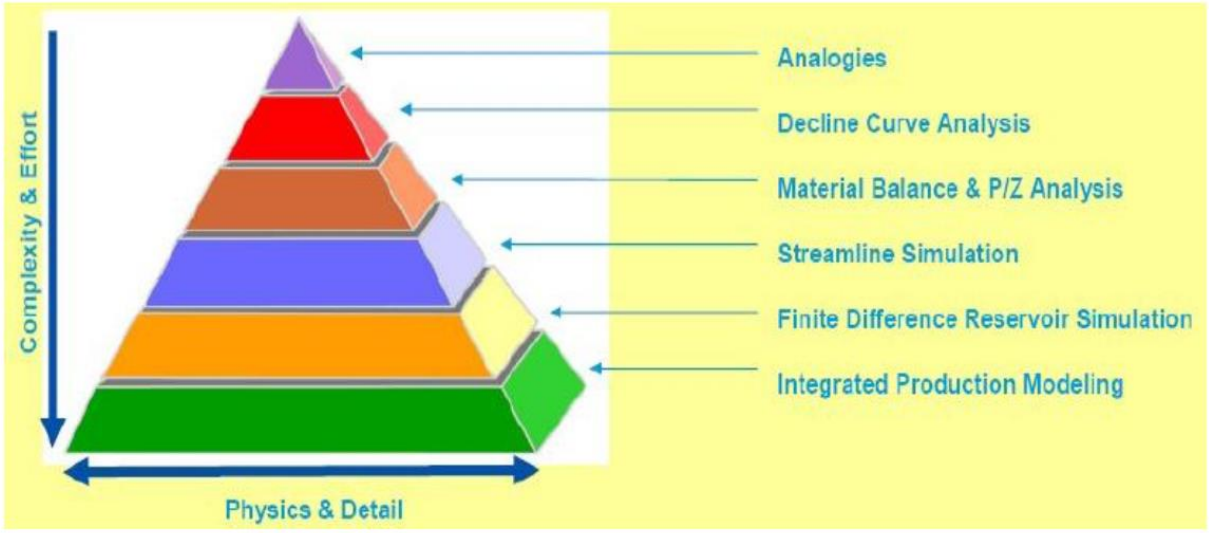


Figure (10) Type of Modeling

Figure (11) shows the reservoir system, (reservoir system include the reservoir rock and fluids, aquifer, ..)

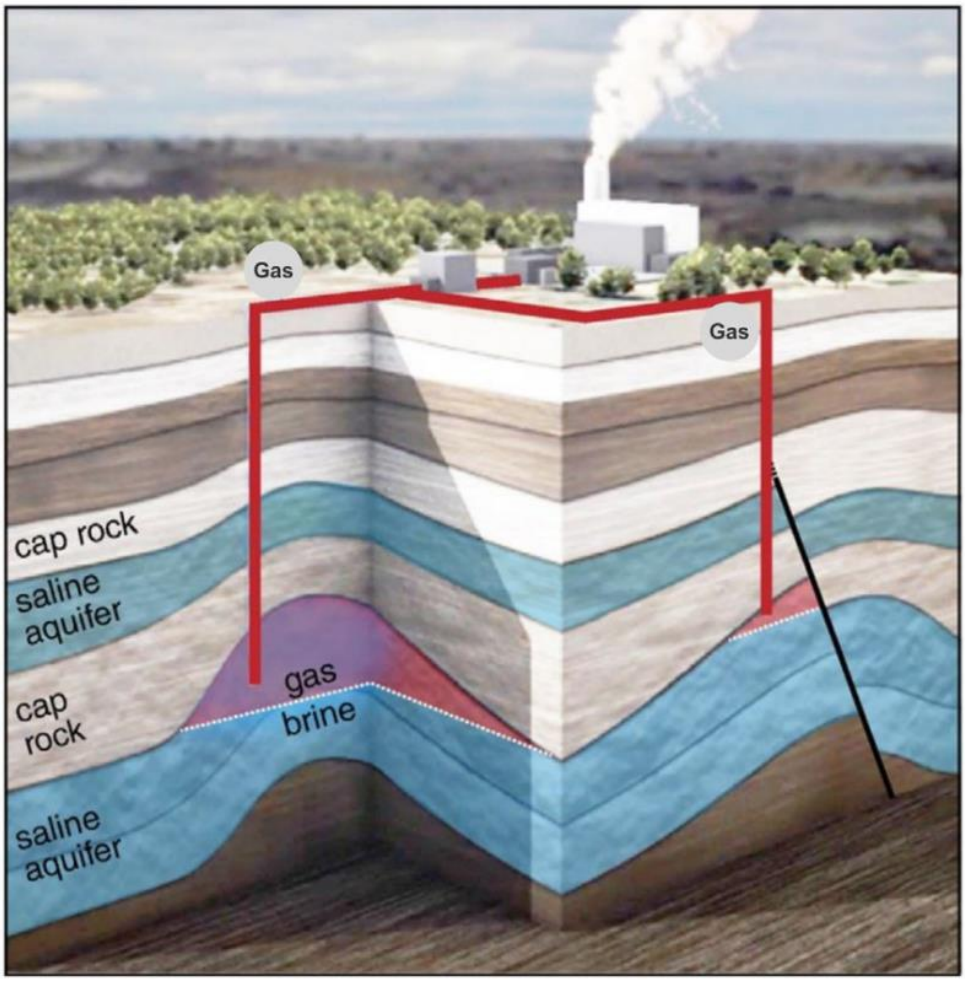


Figure (11) Petroleum Reservoir System

Facilities Requirements:

Facilities are the physical link to the reservoir. Everything we do to the reservoir; we do through the facilities. These include drilling, completion, pumping, injecting, processing, storing. Proper design and maintenance of facilities has a profound effect on profitability. The facilities must be capable of carrying out the reservoir management plan, but they cannot be wastefully designed.

Economic Optimization:

Economic optimization is the ultimate goal selected for reservoir management. Figure (12) presents the key steps involved in economic optimization.

Management Approval:

Many supports and field personnel commitment are essential for the success of a project.

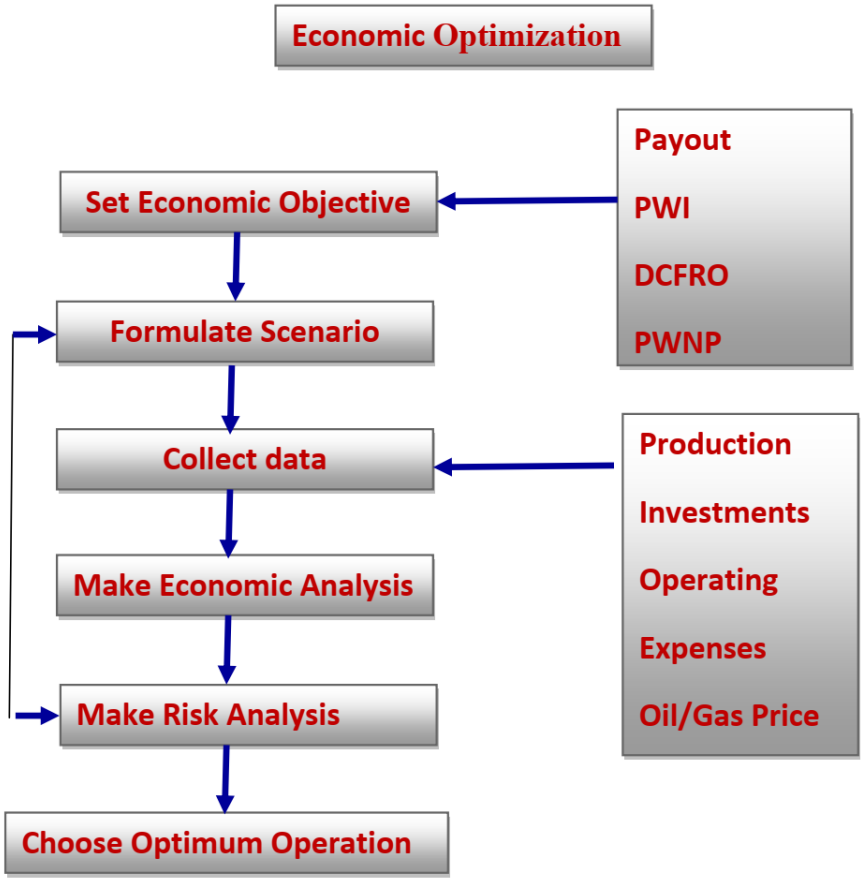


Figure (12) Economic Optimization

IMPLEMENTATION:

Once the goals and objectives have been set and integrated reservoir management plan has been developed, the next step is to implement the plan. Table (2) describes a step – by- step procedure on how to improve success in implementing a reservoir management program.

Table (2)

No.	Reservoir management program.
1	Start with a plan of action, involving all functions.
2	Flexibility
3	Management support
4	Commitment of field personnel
5	Periodic review meetings, involving all team members

1. The first involves starting with a plan of action, including all functions. It is common for many reservoir management efforts to devise a plan.
   If a plan is to be developed and implemented in the best way, it must have commitment from all disciplines, including management.
2. The plan must be flexible. Even if the reservoir management team members prepare plans by involving all functional groups, it does not guarantee success if it cannot be adapted to surrounding circumstances (e.g., economic, legal, and environmental).
3. The plan must have management support, it must have local and higher-level management blessing.
4. No reservoir management plan can be implemented properly without the support of the field personnel. Time and time again we have seen reservoir management plans fail because either they are imposed on field personnel without through explanations or they are prepared without their involvement.
5. It is critical to have periodic review meeting, involving all team members. Most, if not all, of these meetings should be held in the field offices. The success of these meeting will depend upon the ability of each team member to treat their functional objectives.

The important reasons for failure to successfully implement a plan are:

- Lack of overall knowledge of the project on the part of all team members.
- Failure to interact and coordinate the various functional groups.
- Delay in initiating the management process.
-

SURVELLANCE AND MONNITORING:

Sound reservoir management requires constant monitoring and surveillance of the reservoir performance as whole in order to determine if the reservoir performance is conforming to the management plan. In order to carry out the monitoring and surveillance program successfully, coordinated efforts of the various functional groups working on the project are needed. An integrated and comprehensive program needs to be developed for successful monitoring and surveillance of the management project.

The engineers, geologists, and operation personnel should work together on the program with management support. The program will depend upon the nature of the project. Ordinarily, the, major areas of the monitoring and surveillance involving data acquisition and management include:

1. Oil, water and gas production.
2. Gas and water injection.
3. Static and following bottom hole pressure.
4. Production and injection tests.
5. Injection and production profiles and any others adding surveillance.

In case of enhanced oil recovery projects, the monitoring and surveillance program is program is particularly critical because of the inherent uncertainties.

Evaluation:

The plan must be reviewed periodically to ensure that it is being followed, that it is working and that it is still the best plan. The success of the plan needs to be evaluated by checking the actual reservoir performance against the anticipated behavior. Therefore, certain technical and economic criteria need to be established by the functional groups working on the project to determine the success of the project. The

criteria will depend on the nature of the project. A project may be a technical success but an economic failure.

How well is the reservoir management plan working? The answer lies in the careful evaluation of the project performance. The actual performance needs to be compared routinely with expected. see figure (13a &13b).

In the final analysis, the economic yardsticks will determine the success on failure of the project.

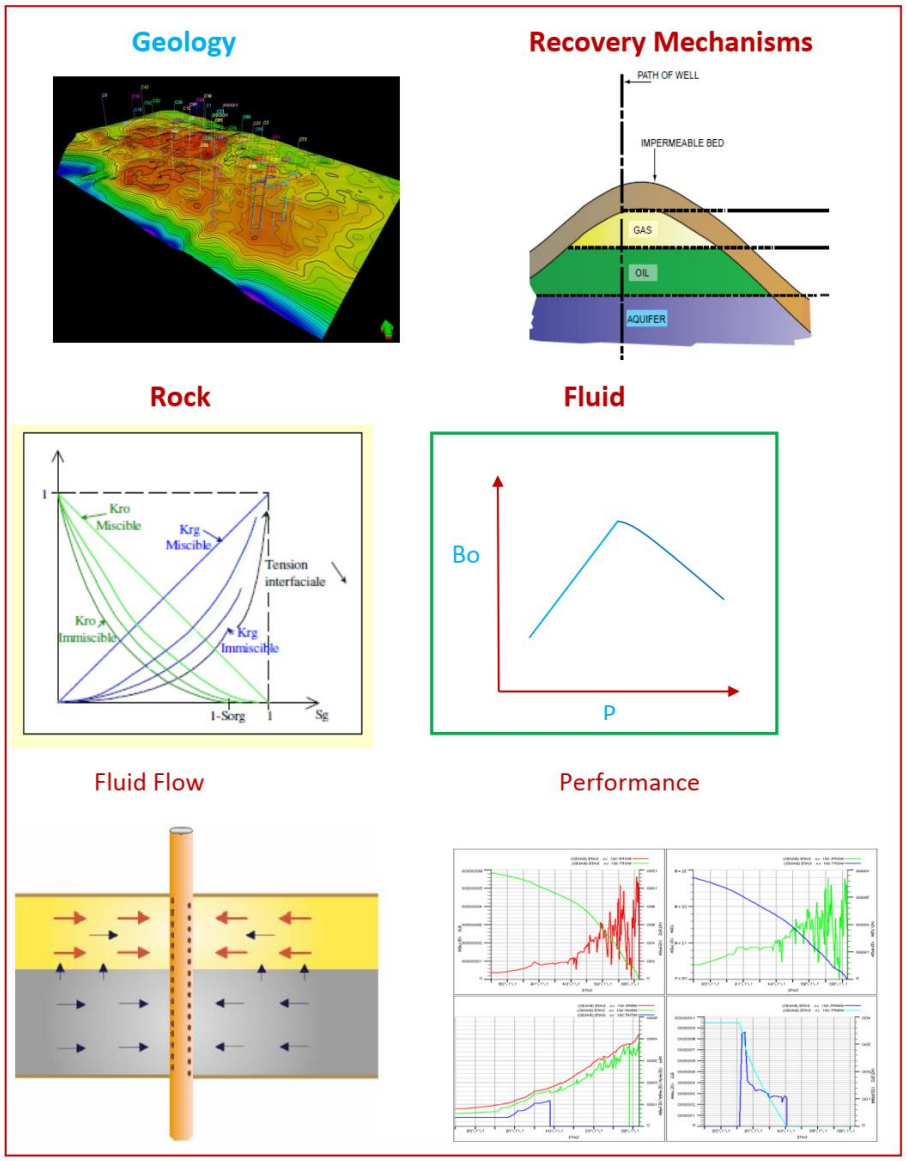
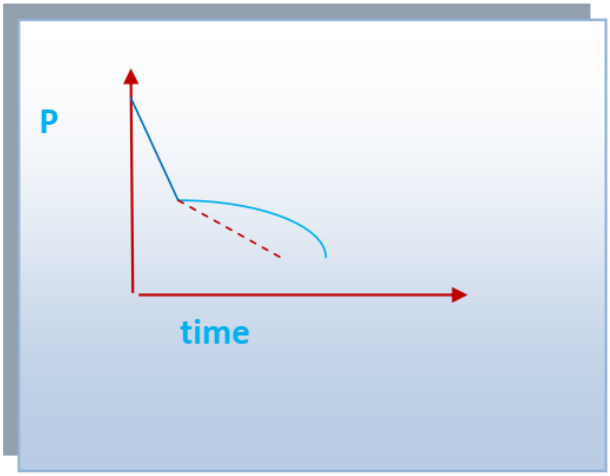
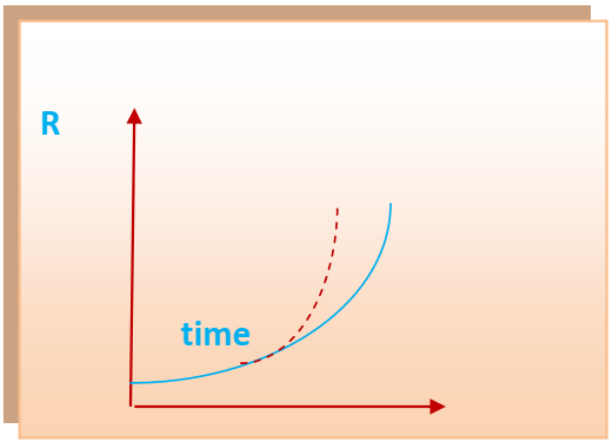


Figure (13a)





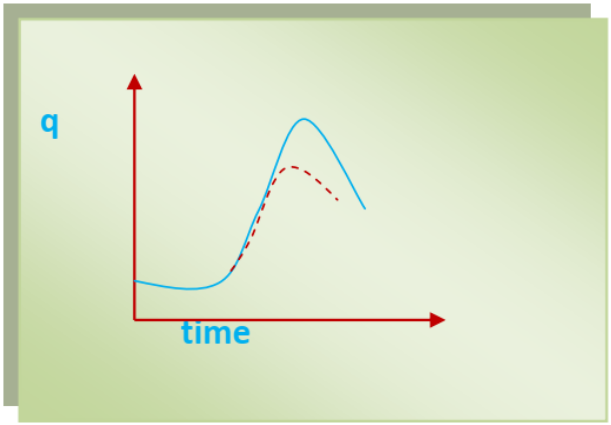


Figure (13b) Evaluation

Actual ———

Plan --------