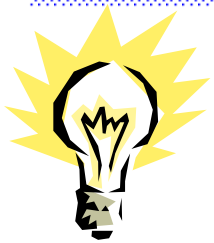
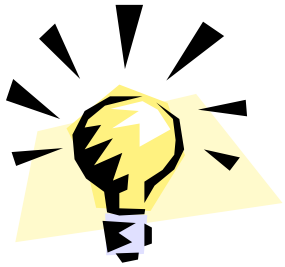
Today's topics

- Creativity and innovation
- Different creativity methods
- Thinking barriers
- Brainstorming and other creativity meetings
- CP option generation
- Information sources for CP
- Evaluation of options
- Implementation of CP options



Creativity

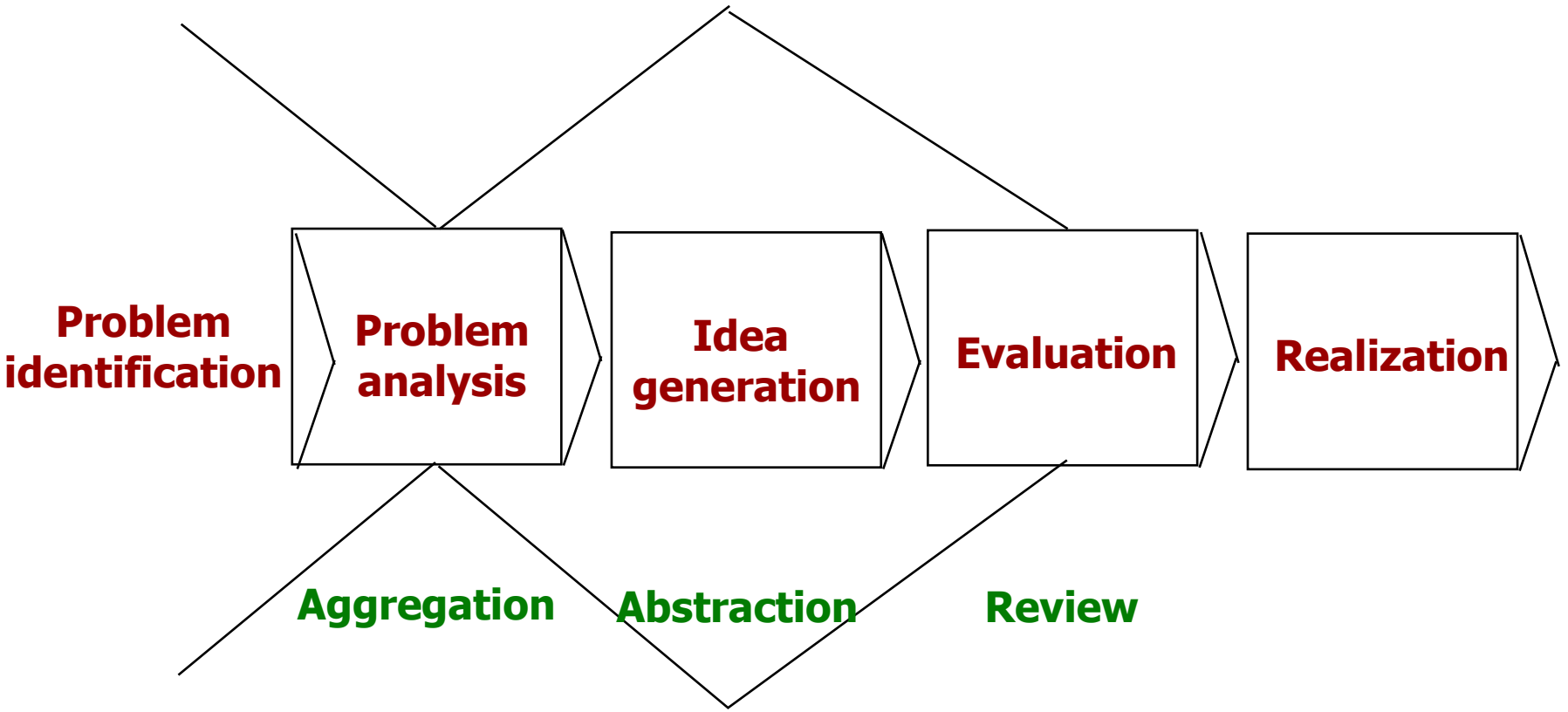
- Creativity is the ability to bring something new into being, something that did not exist before.
- Creativity comprises the development of entirely new systems, the combination of already known information as well as the transfer of known relations to completely new situations.
- A creative action has to be intentional and must have a purpose.



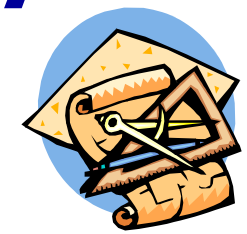
Creativity and the thought process

- Convergent thinking is a fixed, structured and logical way of thinking divided into systematic steps.
- Divergent thinking is a free, disordered and imaginative way of thinking which cannot be followed logically.
- Productive creativity is controlled divergence. Creative thinking is a type of divergent thinking which is adapted to reality.

Stages of creative problem solving



Factors of creative efficiency



Individual factors

- Personality
- Age
- Qualification
- Intelligence
- Motivation
- Stress
- Willingness to take risks

Organizational factors

- Hierarchy
- Autonomy
- Management style
- Information, communication
- Working environment
- Uniformity of procedures

Innovation – 1

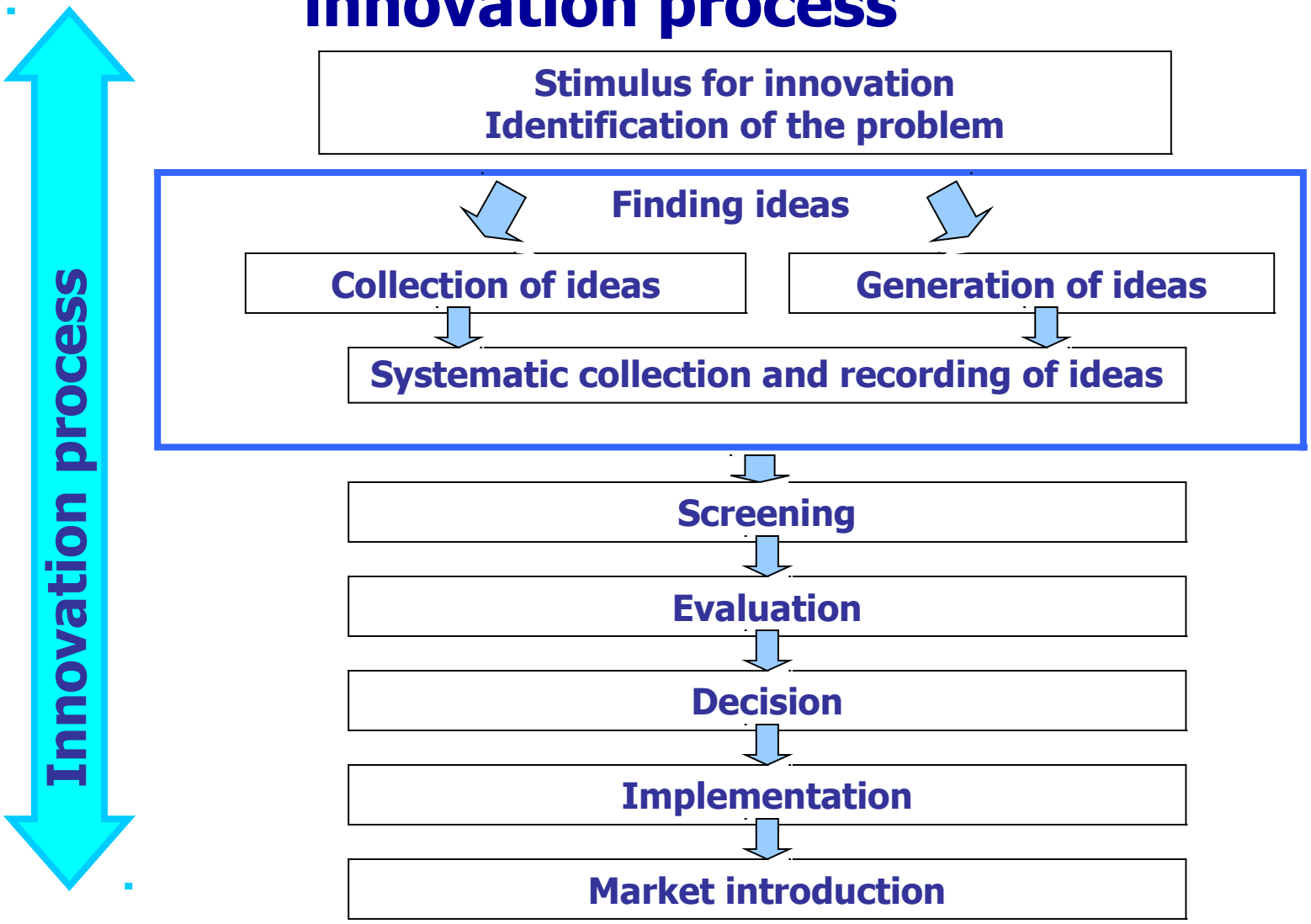
- Only the economic implementation of an idea can be called innovation. The innovation process comprises the generation of an idea, its acceptance (decision) and realization (implementation). Creative thinking is required particularly during the first stage of this process.

- A new idea is not inevitably the result of creative thinking but can be based on modification or imitation. What is more, not every creative process is followed by the implementation of an idea.

Innovation – 2

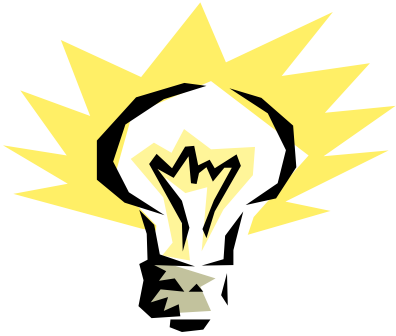
- Innovation includes any type of change performed on a process. At the beginning it is irrelevant, whether this change is new per se or if it is introduced in a particular company for the first time. Consequently the successful transfer of previously known solutions to new applications has to be considered an innovation.

Basic scheme of the innovation process

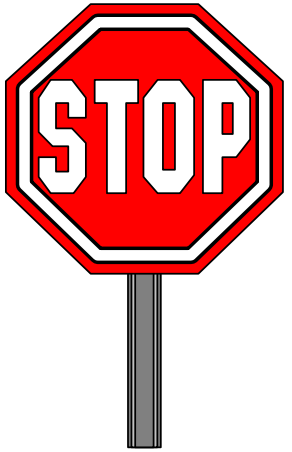


Methods of idea generation

- **Splitting up:**
  - **Morphological analysis**
  - **Progressive abstraction**
- **Linking:**
  - **Brainstorming**
    different methods such as classical, imaginative, destructive-constructive, stop-and-go, discussion 66
  - **Brainwriting**
    Method 635
- **Analogy:**
  - **Synectics, Bionics**



Thinking barriers



- Routines and habits
  - It simply is like that; it is right; ...
- Wrong categories
  - Generalizations, wrong presumptions
- Premature evaluation
  - Too early criticism, typical idea killers
- Emotional insecurity
  - Fear of exposing oneself
- Pressure of conformity
- Cultural barriers
  - Culture of logical and conclusive thinking, no intuition
- Working environment
- Intellectual barriers

Brainstorming

Four principles

- Any kind of criticism is strictly forbidden!
- There are no limits to imagination.
- Quantity comes before quality.
- Take up the ideas of others and develop them.

Working group – your tasks

- Form groups of 3 – 5 persons.
- Describe your problem in the company. Use the W-questions.
- Use brainstorming techniques and consider the tips for moderation, visualization, etc.
- Evaluate the ideas using Worksheet 5-1.

Possible tasks – 1

1. A lighting manufacturer wants to develop a new work light, especially in view of a new target group of environmentally conscious customers (material, light sources).
2. A car repair shop wants to extend its services and is looking for new opportunities in the field of "mobility".
3. A big shopping centre has problems with traffic congestions, especially at the weekends. Parking spaces are rare and cost a lot. The company looks for a solution which is not too expensive.

Possible tasks – 2

4. An interest group would like to introduce an environmental model administration.
5. A company responsible for waste disposal at an airport would like to discuss with the airlines how to separate waste in the aircraft. Which possibilities can you think of?

Successful idea generation group

- 3 – 8 members from different areas
- Social homogeneity of the group
- Coordinator (not necessarily the manager)
- Informal and pleasant atmosphere
- Mixed group (men and women)
- Meetings should not be too long or too frequent
- Clear tasks with clear definitions of roles
- Discussion: always objective, open
- Criticism should be open and objective

Creativity meeting

- Rules of moderation
- Rules of discussion
- Techniques of visualization

Creativity meeting Planning and procedure

Organization of the meeting

- Preparation
- Participants
- Infrastructure
- Definition of the roles
- Definition of the time frame

Agenda of the meeting

- Introduction, definition of the problem
- Definition of the objectives
- Selection of working method
- Joint development of solutions

Creativity meeting
Evaluation and continuation

Check the results

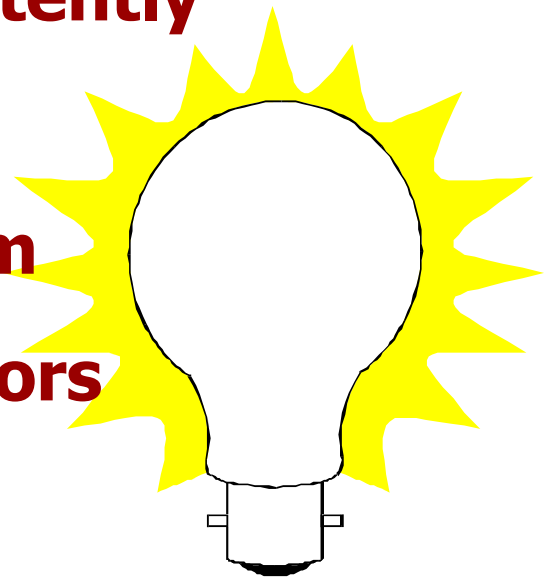
- Discussion of the results
- Evaluation
- Definition of remaining aspects
- Discussion of possible new approaches
- Definition of the next meeting

Take the minutes

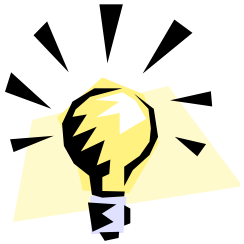
- Sum up all possible solutions
- Take note of everything
- Point out the most interesting possible solutions

New, creative CP options

- Apply the CP methodology consistently
- Ask questions
- Brainstorming with staff in a team
- Adapt CP options from other sectors (i.e. cooling, compressed air, motivation of employees, etc.)
- ...



CP option generation

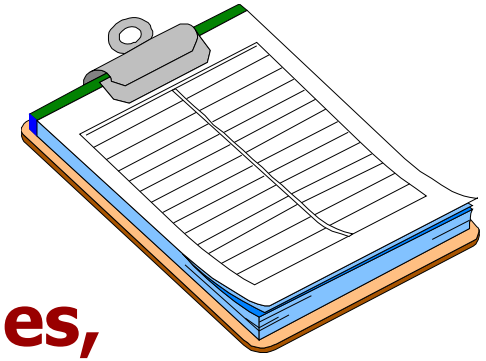


- Standard options
- New, creative options

Evaluation of CP options

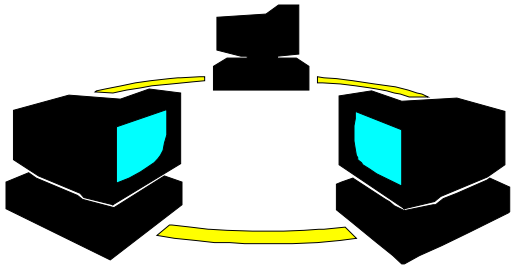
- Technical
- Environmental
- Economic

Standard CP options and information sources



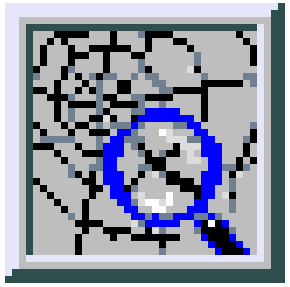
- General checklists from manuals
- Sector-specific manuals and studies, other information sources
- Information from suppliers
- ...

CP information sources



- Manuals, sectoral information
- UNIDO/UNEP/other NCPCs
- Suppliers
- Internet/homepages
- Universities, research centres
- Databases
- Seminars, roundtables, congresses
- Own experience
- Counterparts
- Chamber of Industry and Commerce
- Government, ministries
- Other companies
- Company staff

Useful internet addresses



- **Cleaner production**
  - www.unep.org
  - www.unido.org/cp
  - www.epa.gov/p2
  - www.es.epa.gov
- **Technical information**
  - www.es.epa.gov/techinfo
  - www.ecodesign.at
  - www.acfcp.org.au/case-studies
- **Companies**
  - www3.volvo.com/environment
  - www.sulzer.com/environment
  - www.nokia.com/environment

Useful addresses CP case studies

- Training course www.epa.gov/oia/itc/cpnote/index.htm (how to search on the Internet for CP)
- www.unido.org/cp
- www.unep.org
- www.emcentre.com/unepweb/tec_case/index.htm
- www.unido.org/ssites/env/sectors
- www.cleanerproduction.com/industries
- www.es.epa.gov/techinfo/case/case.html
- www.es.epa.gov/studies

Ten ways to option generation

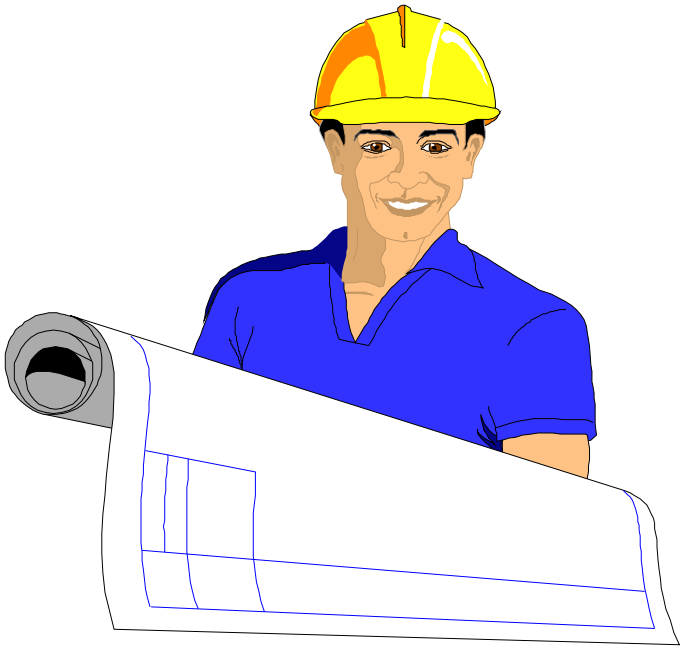
1. The waste box
2. Close the shop
3. "Why, why, why?"
4. Learn from contradiction
5. Indicators and benchmarking
6. Super-super-ideal
7. Method -10%
8. Leave it out
9. Keep it separate
10. Reuse it elsewhere

When to carry out CP option generation and evaluation?

- Within a full CP assessment project
- First company visit: convince the company to participate a project with the NCPC
- EMS initial review
- Enquiries to the NCPC from other companies, consultants associations
- Within a cost reduction audit
- Within continuous improvement
- ...

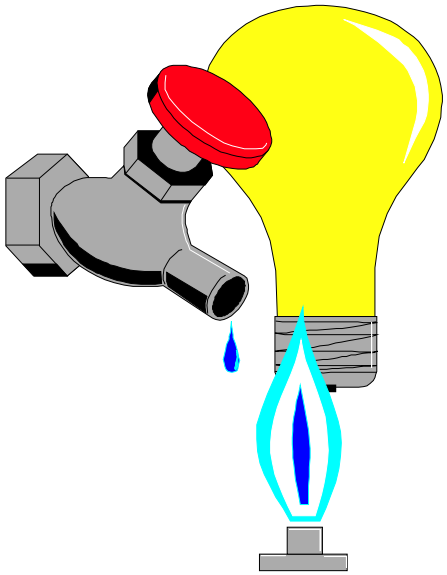
Technical evaluation

- Influence on product quality
- Influence on productivity
- Material consumption
- Energy consumption
- Influence on maintenance
- Safety
- Flexibility
- ...



Environmental evaluation

- Material consumption
- Energy consumption
- Emissions to air, water, soil
- Shift of environmental problems to other media
- Replacement of substances
- Health and safety
- ...



Economic evaluation

- Payback period
- Other financial profitability calculations
- Determine all affected cost factors
  - Obvious environmental costs
  - Costs for lost raw material
  - Investment and depreciation costs of equipment
  - Personal costs
  - Outsourced services
  - Hidden costs

Implementation of environmental projects

Solution-oriented

- Quick implementation
- Well known causes of the problems
- Possibility of improvement is known

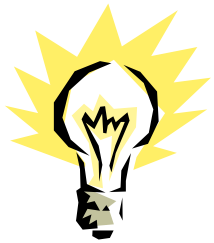
Quick implementation

Problem-oriented

- Complex environmental problems or approaches
- Causes and measures are not clear, a better analysis is necessary
- It is necessary to set goals

Solve the problem at its root

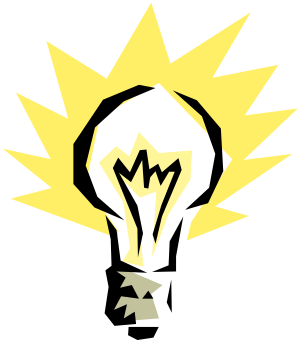
Solve problems at their roots



Stage 1: Determine the necessary measures

Stage 2: Plan the environmental project

Stage 3: Implement



Determine the necessary measures

Stage 1

Decision for environmental protection

Acute environmental problem

Definition of the environmental profile

Identification of the starting point

Plan the environmental project

Stage 2

Environmental problem/description of the starting point/approach

↓

Identification of the causes

↓

Establishment of goals and measures: project plan

Implement the environmental project

Stage 3

Implementation of the project plan

Monitoring of success