UNCERTAINTY, RISK
RISK MANAGEMENT IN THE CONSTRUCTION INDUSTRY

RISK

RISK!

CONSTRUCTION PROJECTS HAVE LOTS OF IT, CONTRACTORS MANAGE IT AND PROJECT OWNERS PAY FOR IT.

RISK AND UNCERTAINTY

- RISK is associated with every human decision-making action, of which the consequences are uncertain.

- UNCERTAINTY arises as decision-making is oriented towards the future.

- Source of uncertainty is sometimes the lack of information.

RISK AND UNCERTAINTY

- <u>RISK</u> exists when a decision is expressed in terms of a range of possible outcomes and when known probabilities can be attached to the outcomes.

- <u>UNCERTAINTY</u> exists when there is more than one possible outcome of a course of action but probability of each outcome is not known.

DIFFERENT USES OF THE WORD "RISK"

- <u>AS A SOURCE</u> : Inflation risk

- <u>AS A CONSEQUENCE:</u> Cost overrun risk

- <u>AS THE PROBABILITY OF OCCURRENCE OF A NEGATIVE EVENT</u>: Risk of an earthquake

RISK

- SOURCE

- IMPACT/CONSEQUENCE

- PROBABILITY OF OCCURRENCE

- CONTROLLABILITY

- ACCEPTABILITY/ATTITUDE

RISK SOURCES AND EFFECTS

- <u>SOURCES</u>: Adverse weather conditions, inflation, labour productivity, availability of materials, political interferences, contract conditions etc.

- <u>EFFECTS/IMPACTS</u>: Failure to keep within the budget, within the target time frame, comply with the requirements of quality (technical performance, environment, health, safety, customer satisfaction etc.)

| SOURCE	→	EVENT	→	EFFECT

Lack of safety provisions

Defective equipment

Inexperienced workforce

Injury to workman on site

Death of workman

Project's stopped by Health and Safety Officer

Delay

Prosecution and fine by authorities

Loss of morale and productivity

TYPES OF RISK IN TERMS OF CONTROLLABILITY

- Those factors that are within your control

- Those in the control of others with whom you will interact

- Those that are results of government actions

- Those factors that are outside control of parties involved in the project
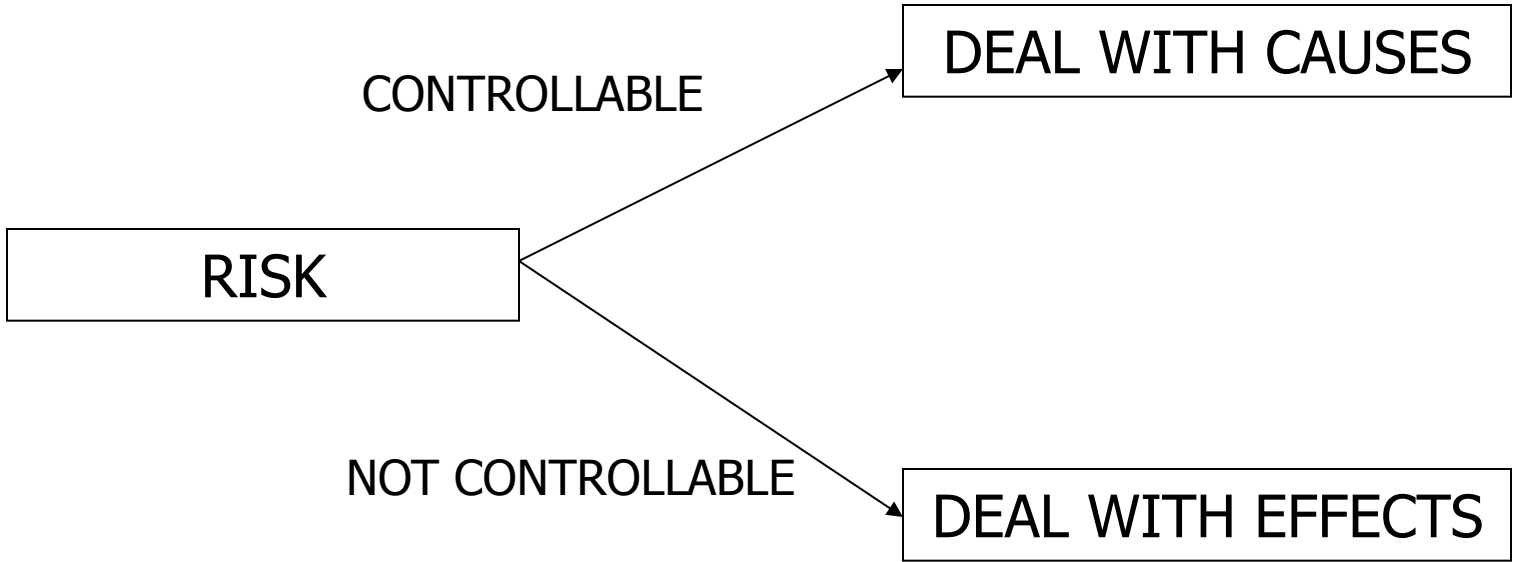
RISK ATTITUDE

- RISK TAKER
- RISK NEUTRAL
- RISK AVERSE

RISK

- THE TERM RISK DOES <u>NOT</u> NECESSARILY REFER TO THE CHANCE OF BAD CONSEQUENCES, IT CAN ALSO REFER TO <u>THE POSSIBILITY OF OPPORTUNITIES</u>.

- RISK IMPLIES VARIATION: IT MAY BE IN THE POSITIVE OR NEGATIVE SIDE!

QUANTIFICATION OF RISK

RISK = f (probability, impact)

Sometimes denoted as;

Risk = Σ probability x impact

PROBABILITY

- Probability is the ratio of occurrence to the total number of equally likely cases.

- However, there is a much more subjective or judgemental view!

- Probability theory deals with events of a special kind, called random (stochastic) events, whose outcomes are affected by chance.

# Two schools of thought about probability theory:

- <u>Objective probability:</u> Probabilities must relate to long term frequencies of occurrence. Only after repeated observations, we can speak of the relative frequency of events and associated probabilities.

- <u>Subjective probability:</u> Probability of an event is the degree of belief or confidence placed in its occurrence by the decision-maker on the basis of the evidence available (experience, intuition, gut feel, rules of thumb)

PROJECT RISK

<u>Project risk</u> is an activity, event or action which tends to cause a negative impact on the planned goals of project scope, quality, performance, execution time or cost.

Each decision making problem has the following steps:

•Objective setting

•Definition of criteria, decision variables and constraints

•Definition of alternatives

•Calculation of performance of each alternative

•Choosing the best alternative
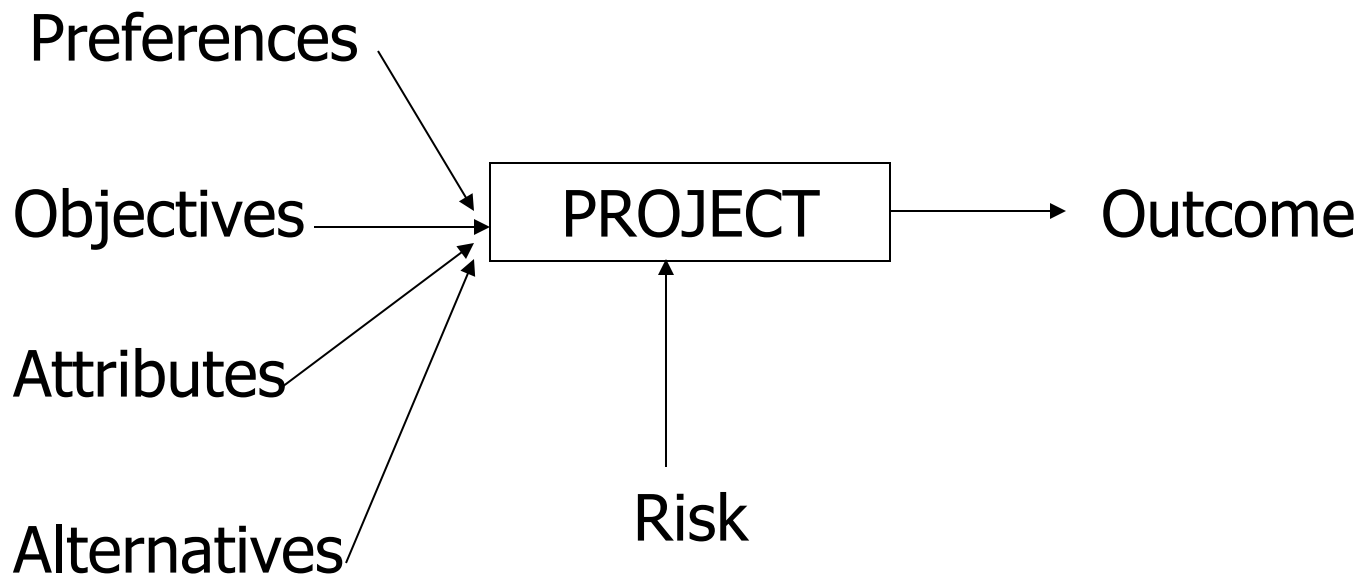
- OBJECTIVES:

Objective function = f(a,b,c, …)

(an expected value of f)

- OUTCOMES:

(usually realised value of f is different than its expected value)

- RISKS

(the difference between expected and realised values of f is due to risks)

- What we need to do under risky situations is to construct a MODEL based on subjective/objective probabilities associated with risks, relationships between them and which maps past experience to future expectations.

RISK AND REWARD GO HAND IN HAND!

THE BASIC QUESTIONS TO BE ANSWERED ARE:

- Will the returns of the project justify the risks?

- What will be the loss if everything goes wrong?

RULES FOR RISK TAKING

- Do not risk a lot for a little
- Never risk more than you can afford to loose (place your waterline low- you can try everything as long as it is above the waterline).
- Devise alternative options as a contingency measure.
- Do not carry all risks in one basket.
- Consider the controllable and uncontrollable parts of the risk.
- Transfer risks to the party which can retain them with the minimum cost and is able to control them.
- Do not forget the residual and secondary risks.

MOST WIDELY USED PHILOSOPHY IN CONSTRUCTION:

AGAP (All Goes According to Plan)

REQUIRED WAY OF THINKING:

WHIF (What Happens IF)

4 WAYS TO TACKLE RISK IN THE CONSTRUCTION INDUSTRY:

- <u>The umbrella approach:</u> where you allow for every possible eventuality by adding a large risk premium to the price.

- <u>The ostrich approach:</u> where you bury your head in the sand and assume everything will be alright.

- <u>The intuitive approach:</u> Do not trust all the fancy analysis, trust your intuition and gut feel.

- <u>The brute force approach:</u> You focus on the uncontrollable risk and force things to be controlled.

RISK MANAGEMENT PHILOSOPHY:

- *Risk management* aims to ensure that all that can be done will be done to ensure the project objectives are achieved.

- Once a risk is identified and analysed, it ceases to be a risk and becomes a management problem.

RISK MANAGEMENT (RM)

RM is a formal process for *systematically identifying, analysing* and *responding* to risk events throughout the life of a project to obtain the optimum or acceptable degree of risk elimination or control.

WHY CONSTRUCTION INDUSTRY IS SUBJECT TO MORE RISK THAN MANY OTHERS?

- <u>Physical nature of the product</u>: large size, technical complexity, high capital requirement, wide geographical range, made specifically according to the requirements of each customer, most parts are manufactured elsewhere, one-off type of projects etc.

- <u>Parties:</u> high number of parties involved, contractual complexity, subcontracting, partnering, client is usually the government etc.

- <u>Structure of the industry</u>: many contractors of various sizes, fragmented industry, competitive bidding, selection criteria based on cost factors etc.

- <u>Determinants of demand:</u> derived demand

- <u>Price factors:</u> priced before construction, cost-time tradeoff, progress payments system etc.

- <u>Vulnerability to environmental factors</u>: weather conditions, legal, political, economical factors etc.
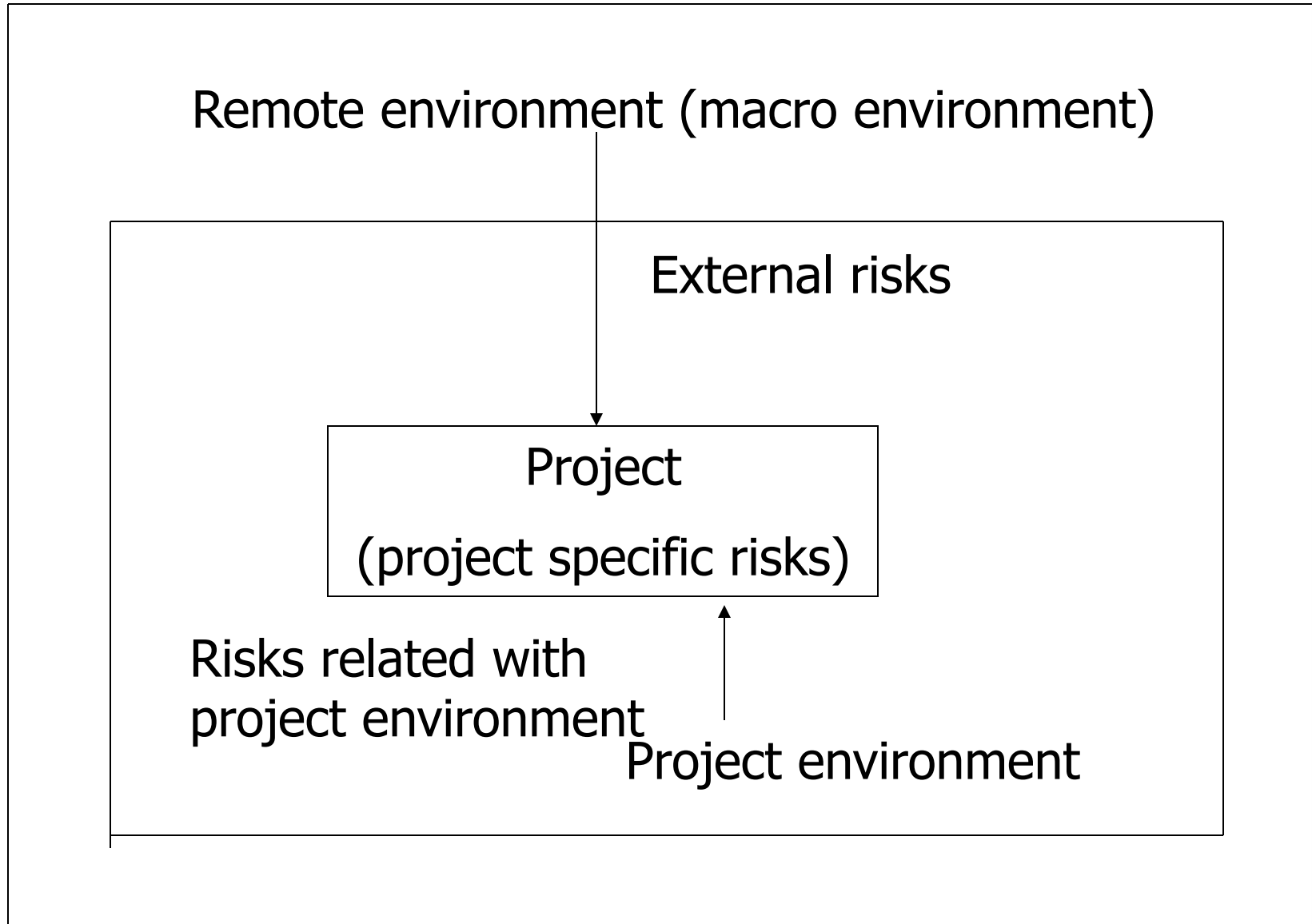
Remote environment (macro environment)

External risks

Project

(project specific risks)

Risks related with
project environment

Project environment

- **<u>Project specific</u>**: design changes, technical problems etc.

- **<u>Remote environment</u>**: Unforeseen weather conditions, inflation etc.

- **<u>Project environment:</u>** Poor information flow between the parties, inexperience of subcontractor etc.

Definitions, assumptions and decisions are also sources of risk!

In addition to these risk factors, decisions given at each stage of project realisation create new risks for the forthcoming parts of the project.

PROJECT RISK MANAGEMENT METHODOLOGIES

- PRAM - Project Risk Analysis and Management – *Association for Project Management*, UK, 1997

- RAMP – Risk Analysis and Management for for Projects – *Institution of Civil Engineers (ICE),* UK, 1998

- PMBoK – Project Management Body of Knowledge – *Project Management Institute (PMI),* USA, 2000

PROJECT MANAGEMENT KNOWLEDGE AREAS

- PROJECT RISK MANAGEMENT
- PROJECT INTEGRATION MANAGEMENT
- PROJECT SCOPE MANAGEMENT
- PROJECT TIME MANAGEMENT
- PROJECT COST MANAGEMENT
- PROJECT QUALITY MANAGEMENT
- PROJECT HUMAN RESOURCE MANAGEMENT
- PROJECT COMMUNICATIONS MANAGEMENT
- PROJECT PROCUREMENT MANAGEMENT
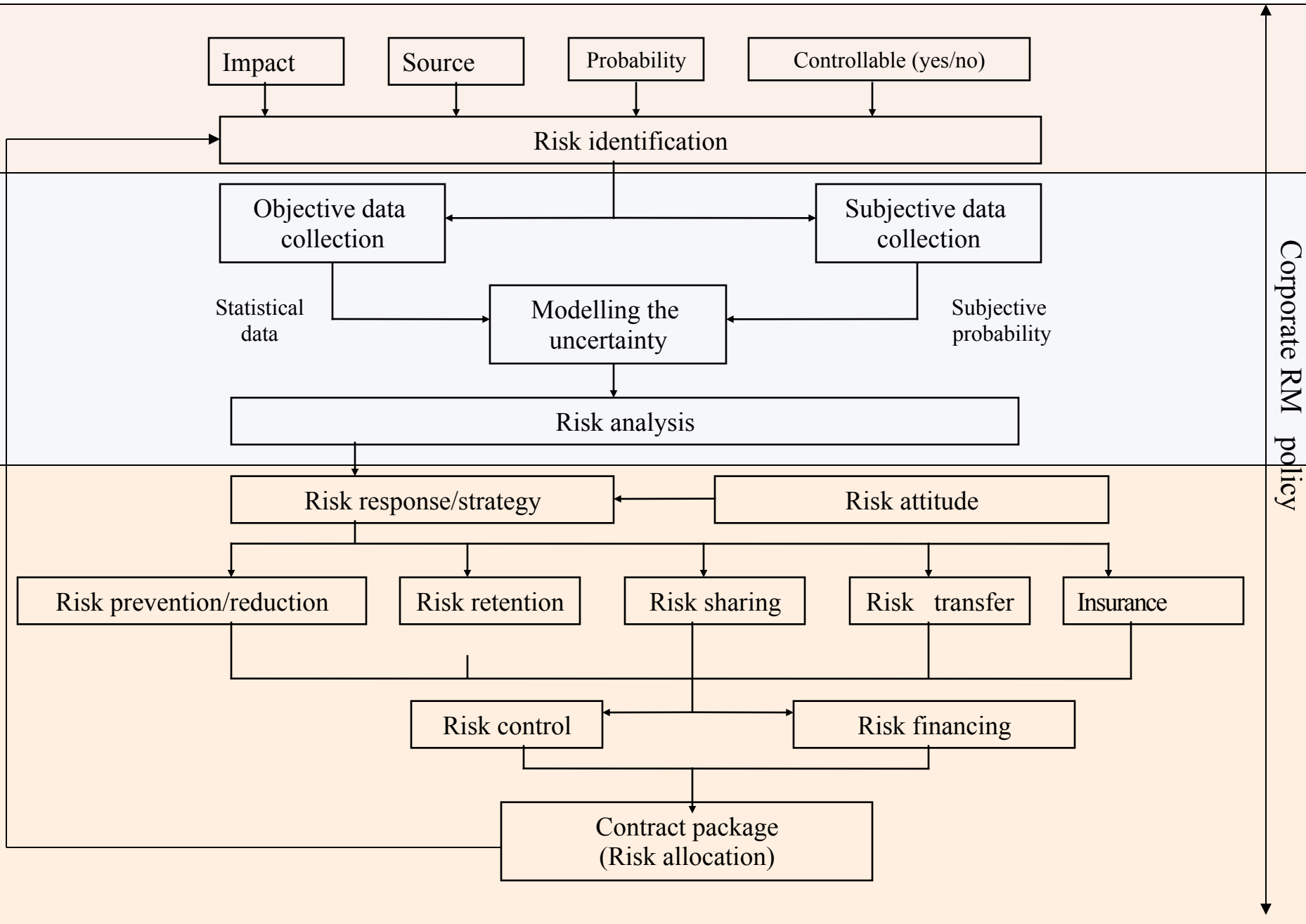
RISK MANAGEMENT :

Risk Management should be

- Carried out by all of the parties (client, contractor, financial agency, consultancy etc.) and,

- At each stage construction (pre-feasibility, feasibility, design, contract/procurement, construction, operation).
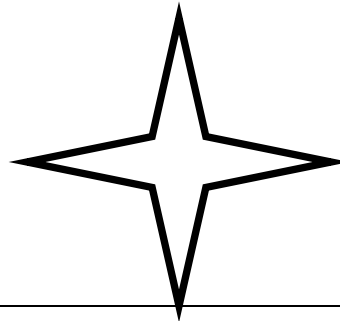
RISK MANAGEMENT TIMELINE

TRIGGER EVENT

PROJECT START

PROJECT END

BEFORE THE RISK:
 FOCUS ON RISK
 PREVENTION
 AND PLANNING

AFTER THE RISK:
 FOCUS ON RISK
 RECOVERY

AVOID OR MITIGATE RISKS;

USE CONTINGENCY PLANS

ESTABLISH CONTINGENCY PLANS