

Atkins China – Asset Management Strategy Development

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Management of Assets – where is the focus?

- | | |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------|
| equipment | - pumps, pipes, filters, stirrers, motor drives, transformers, switchgear, cabling, control panels, fire fighting equipment, etc. |
| facilities | - buildings, control stations, warehouses, offices, changing areas, stores, heating, air conditioning, lighting |
| infrastructure | - water systems, drainage, structures |
| repair items | - workshops, compressors, tools, vehicles, |

Who are we?

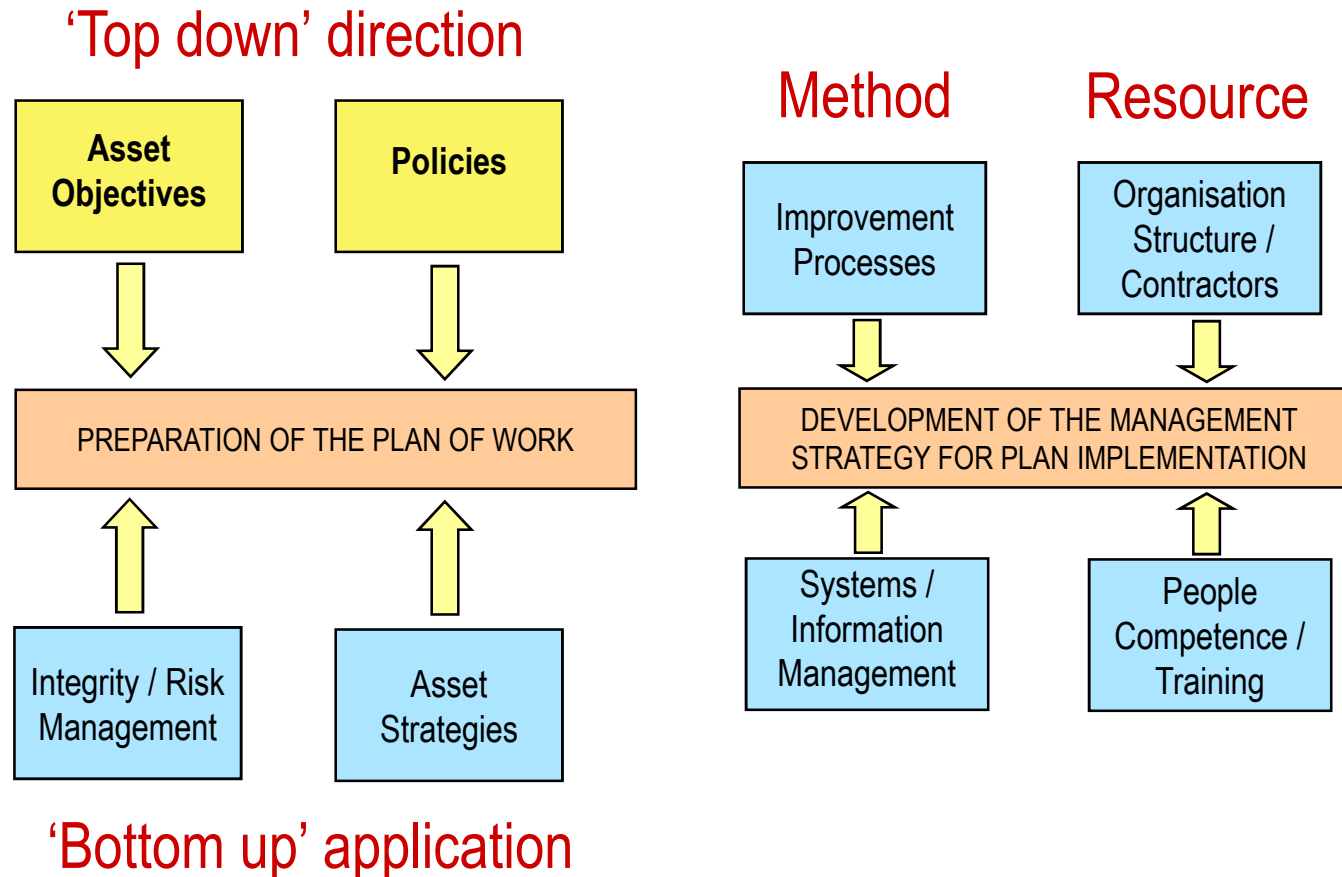
- we are experienced engineering and management people
- we offer ideas and resource for improving our client`s asset management
- we work together to estimate the benefits and costs of improvement ideas
- we assist in the implementation of any improvement changes approved
- we bring engineering, facilities, management experience from 17,000 staff,
- we have offices globally, including seven in China

Why should Asset Management be important to you?

- PAS 55 is the specification seen in HK as the way forward, by Towns-gas, WSD, CLP, MTR, Dock Terminals
 - to set objectives related to the business plans / asset objectives
 - to implement management processes for your situation
 - to design of the right jobs, for the right time, with the right people, with the right training, with the right spares / tools / materials
 - to comply with operational / regulatory / environmental needs
 - to ensure safety of the people is a top consideration
- *effective asset management planning is essential for these issues*

Major Elements of Asset Management

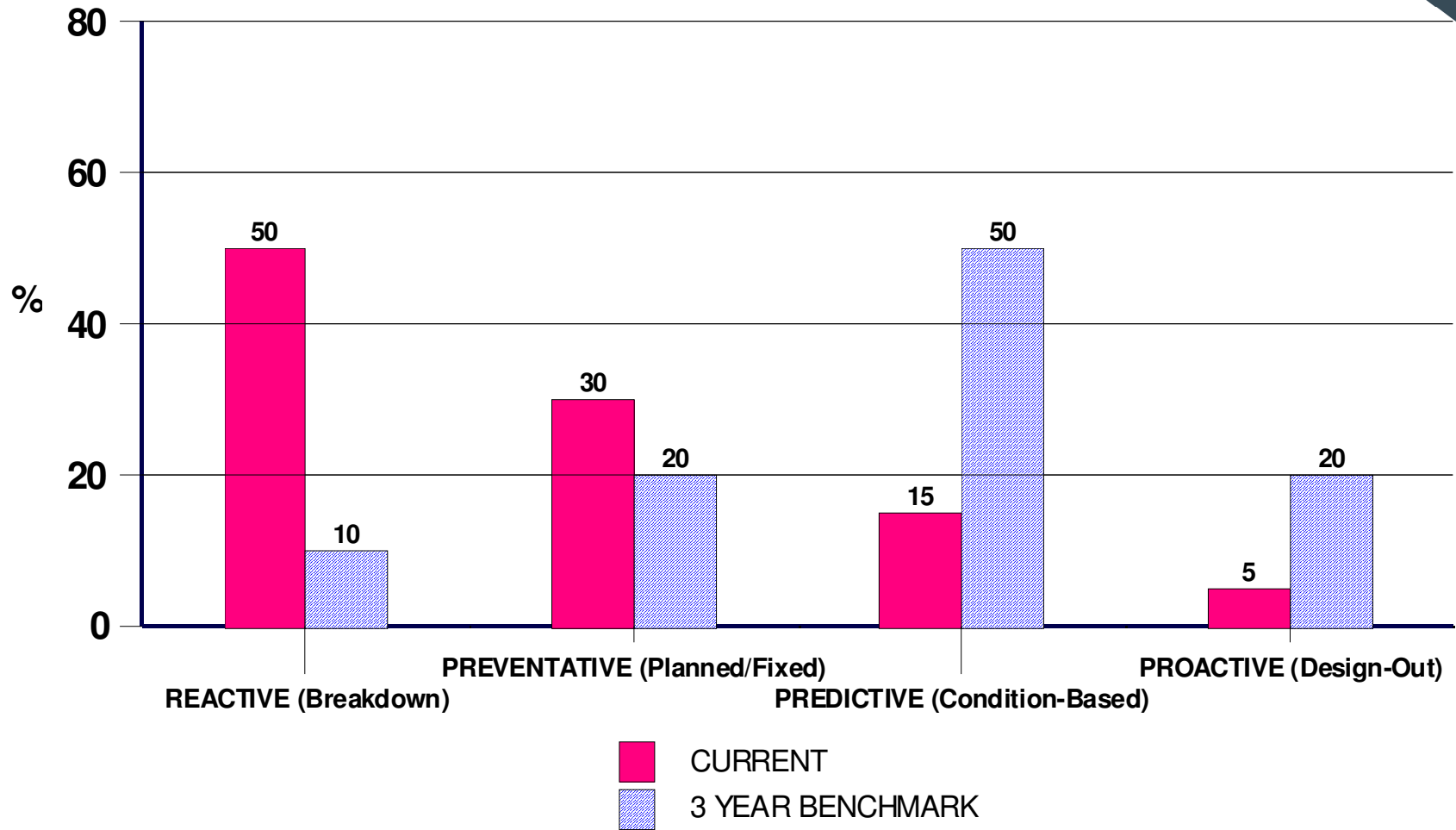
- how does it work?



Objectives and Policies

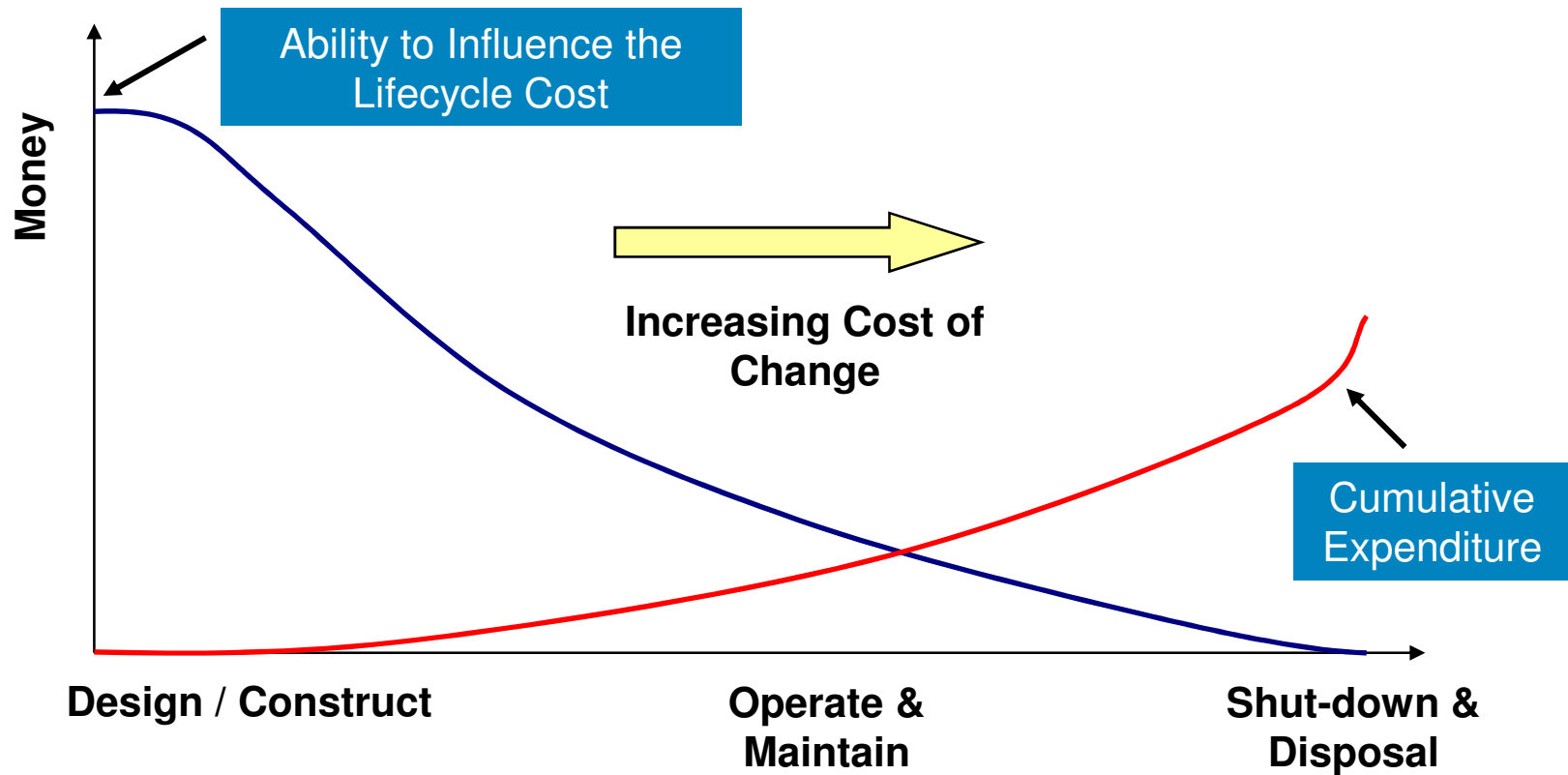
- are they approved / supported from the top?
- do they give the required direction, including:
 - preventive asset strategies, focus on asset criticality?
 - early equipment management?
 - life cycle costing?
 - the need and format for the objectives?
 - rules for compliance to health & safety / asset criticality?
- approach to computer systems use?
- give guidance to the approach for outsourcing, type of contract, training?

Current Vs. Targets - Maintenance Activities a 3-Year Vision Target



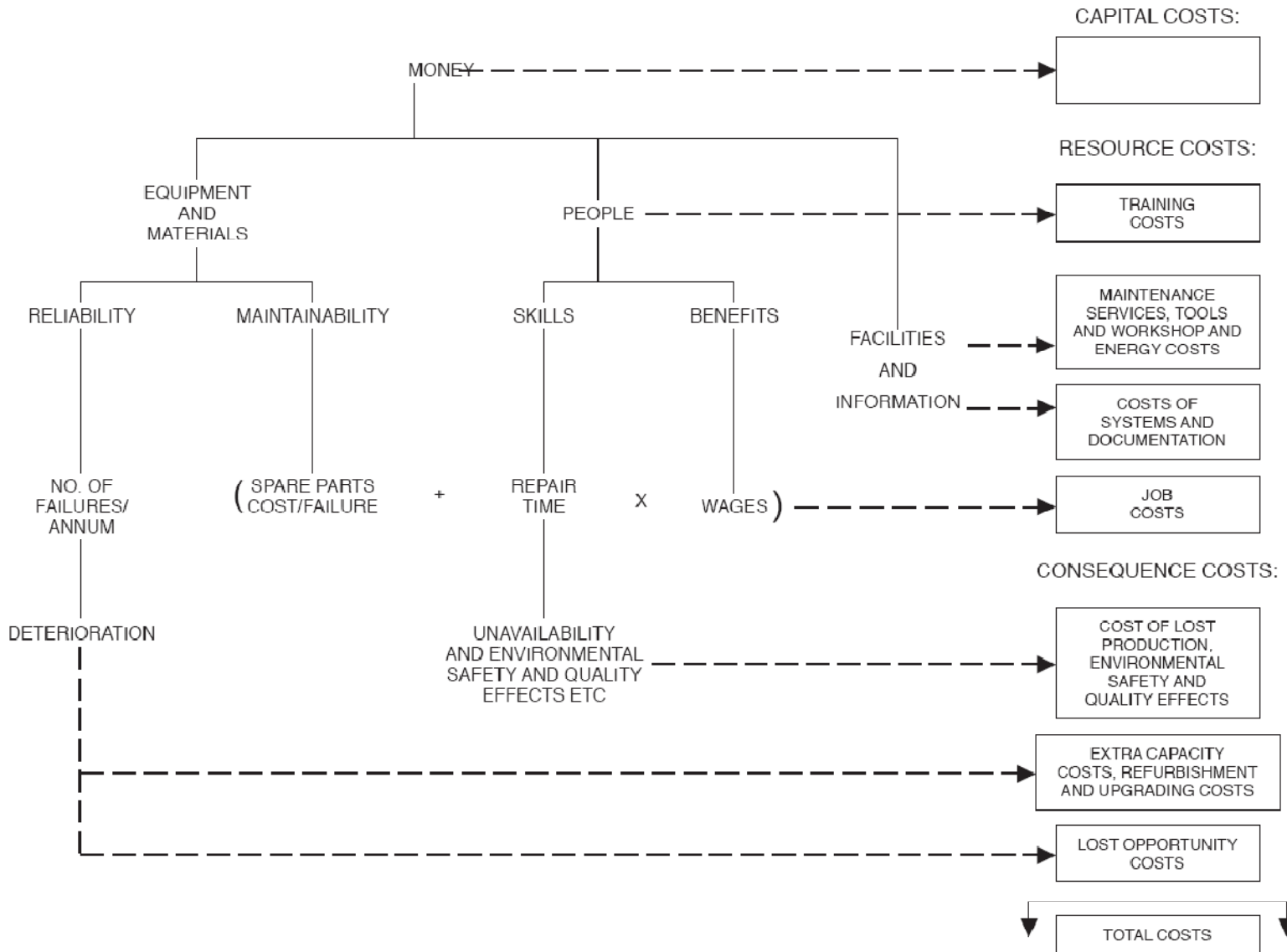
Recommended policy

- plan for 'early asset management'



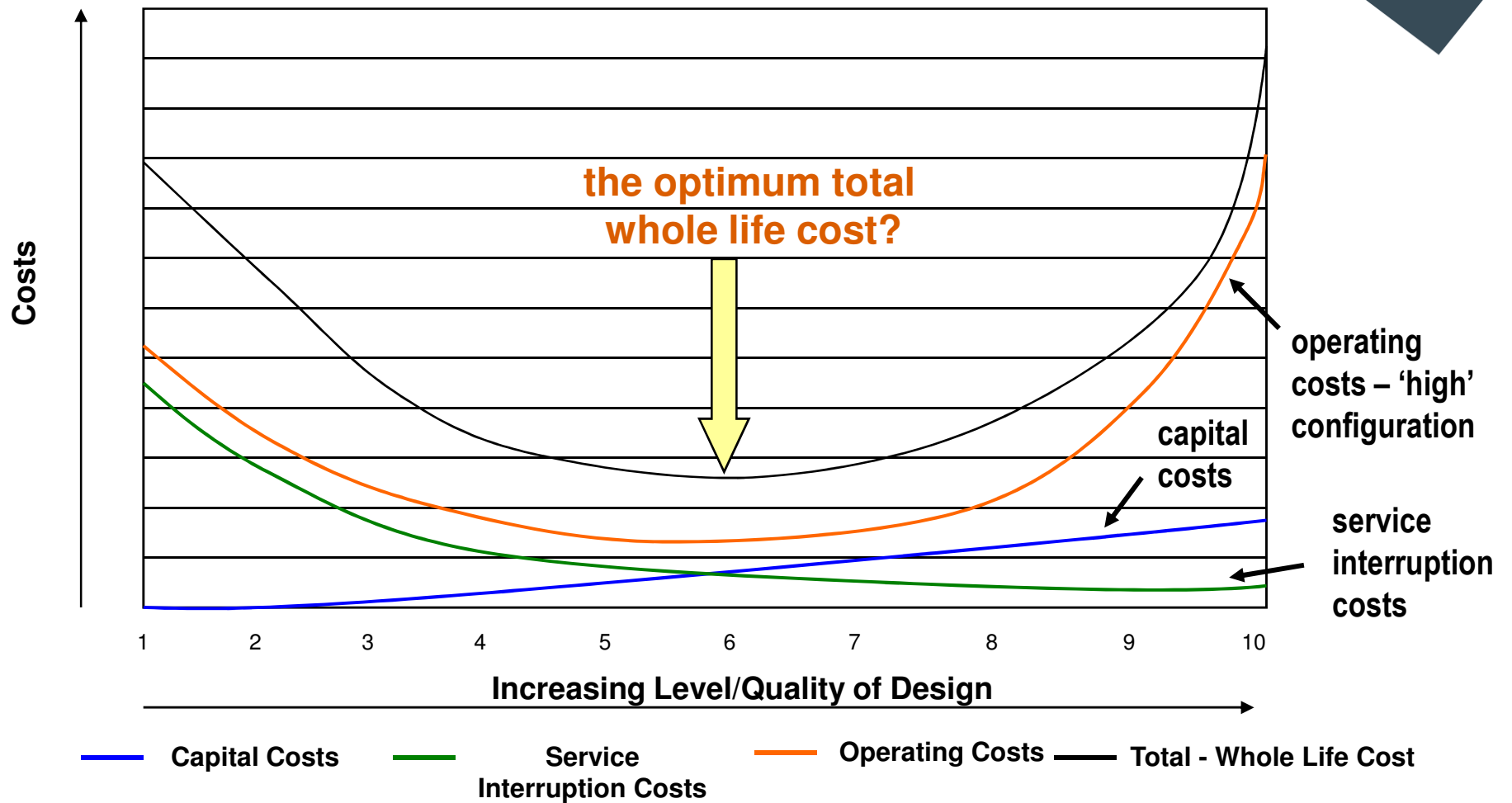
Recommended policy

- implement a robust budget /cost system



Recommended policy

- seek the optimum 'life cycle cost'



Objectives to be met – ‘Balanced Scorecard’

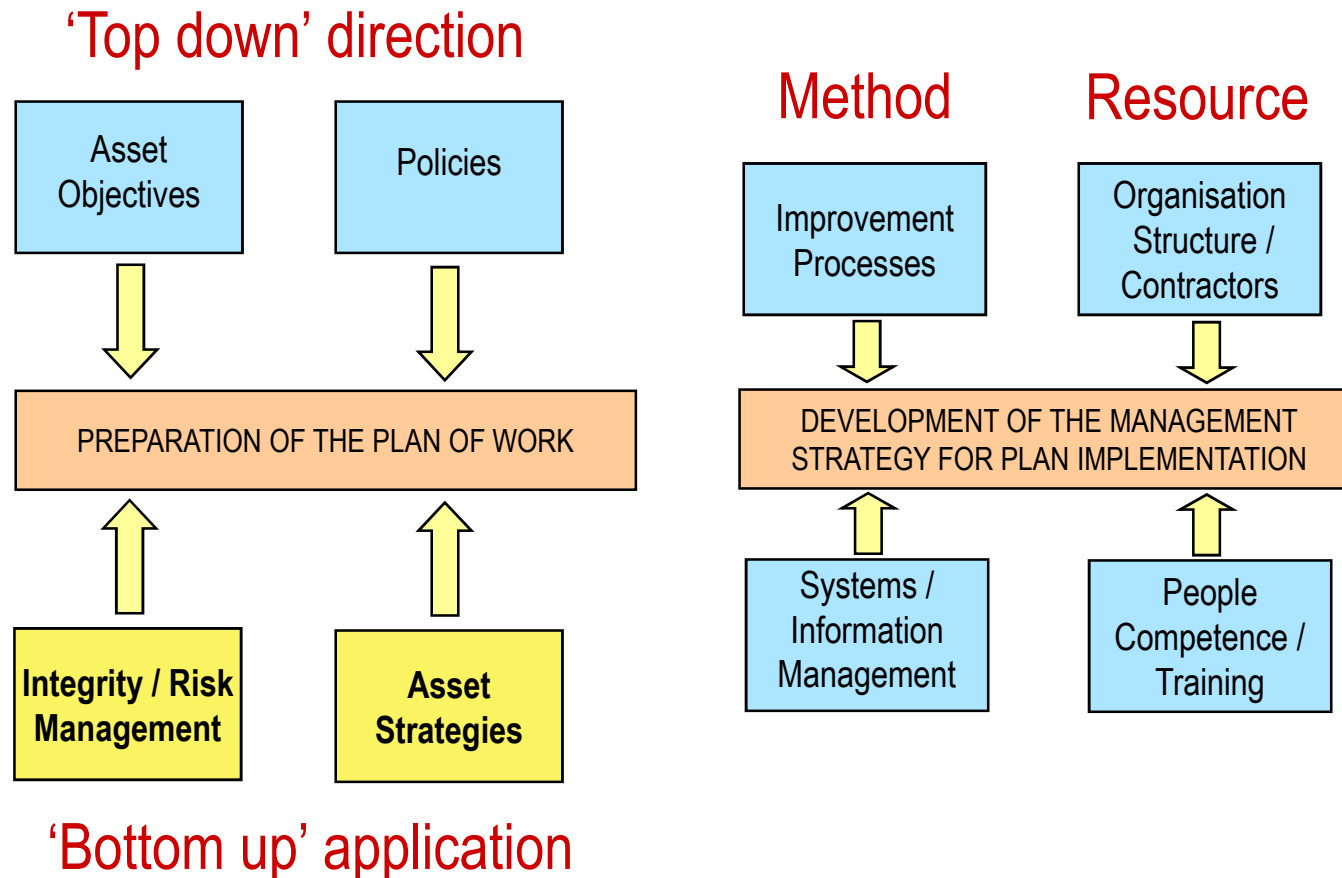
- costs / budgets / life cycle costs
- throughput / focus on critical assets / reliability / availability
- response times / timely preparation of plans
- compliance – to safety / environment / no flooding

- % of work planned, % schedule completion, stock / cost control levels
- plant downtime due to lack of planning, short work backlog

- safety incidents / contractor performance to service level contracts
- safety / utilisation / % training of budget / number of repetitive jobs

Major Elements of Asset Management

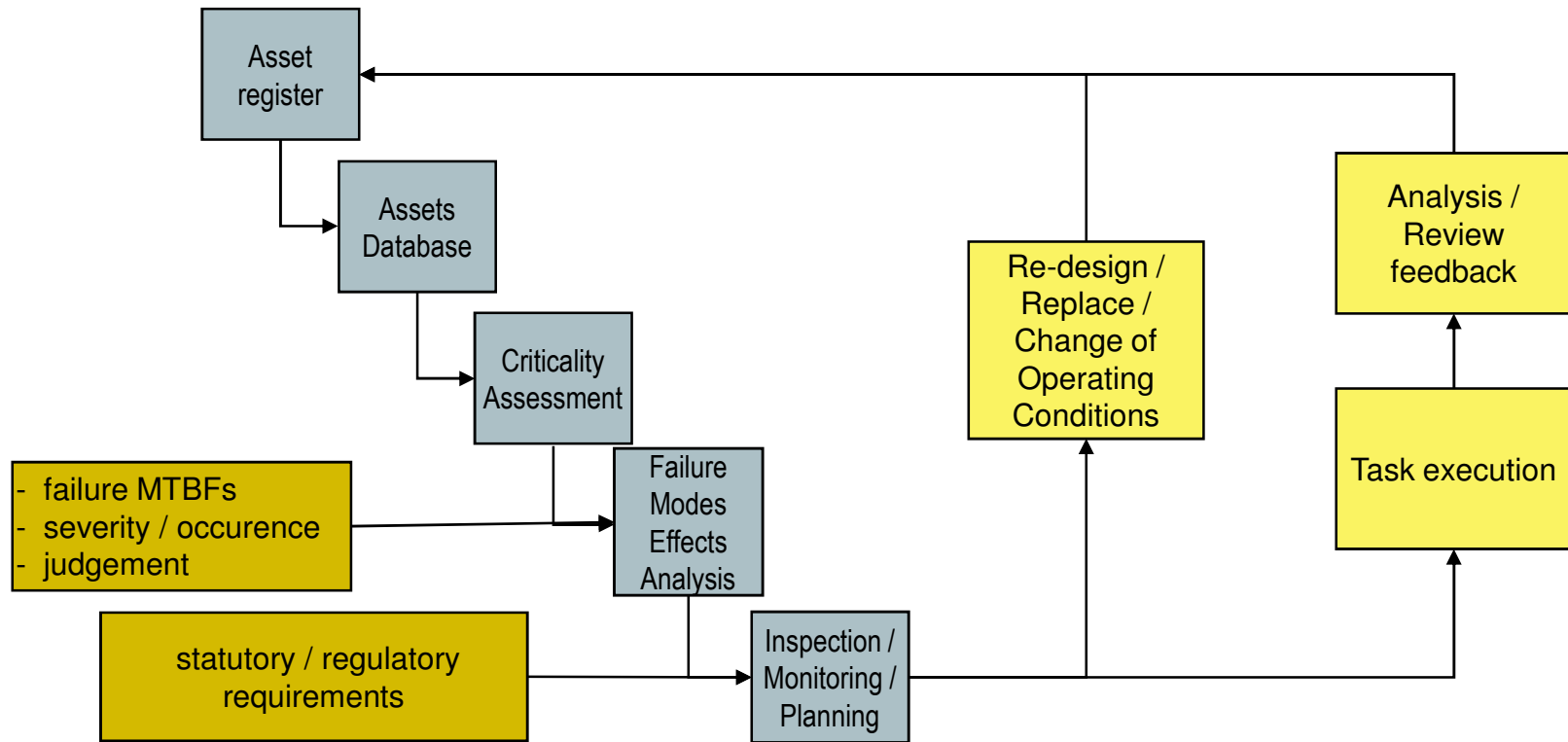
- how does it work?



Controlling the risks of not meeting the objectives

- what are the processes for risk assessment?
- how do we categorise the risk - is information available?
- is a criticality rating being determined?
- are the available tools/data used to identify how to control the risk impact?
- are activities being prepared and reviewed as information is improved?
- are regular condition surveys carried out, and asset performance monitored to review the effect of the activities?

Risk Based Driven Activities



Asset register coding system

- for recording asset life costs within a maintenance computer system
- description and recognition of asset / equipment / component
- link with the materials use / stores stock items and specifications
- prioritisation of the asset within a criticality rating
- applicable to bridge bearings, pavements, lighting, road surfaces, repair tools, vehicles, etc.

- **Highway Area / Site** **A**
- **Section / Plant** **A**
- **Asset system** **A**
- **Equipment item** **00**
- **Equipment component** **00**

- **Code system: AAA0000**

Criticality – by assessment

Harm to
People /
Assets /
Environment/
Reputation

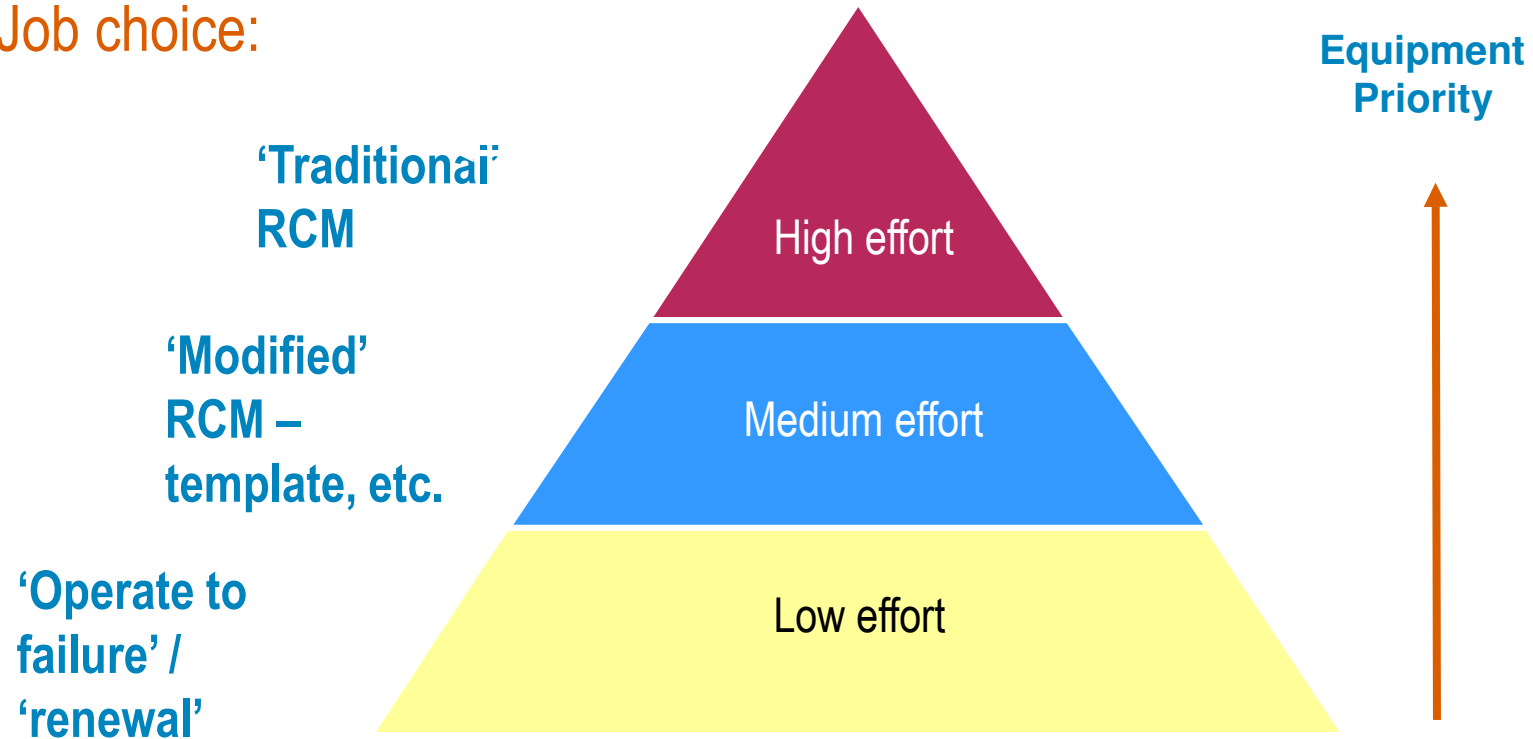


Severity	CONSEQUENCES				INCREASING LIKELIHOOD				
	People	Assets	Environment	Reputation	A	B	C	D	E
					Never heard of in the Industry	Heard of in the Industry	Has happened in the Organisation or more than once per year in the Industry	Has happened at the Location or more than once per year in the Organisation	Has happened more than once per year at the Location
0	No injury or health effect	No damage	No effect	No impact	Blue	Blue	Blue	Blue	Blue
1	Slight injury or health effect	Slight damage	Slight effect	Slight impact	Blue	Blue	Blue	Blue	Blue
2	Minor injury or health effect	Minor damage	Minor effect	Minor impact	Blue	Blue	Blue	Yellow	Yellow
3	Major injury or health effect	Moderate damage	Moderate effect	Moderate impact	Blue	Blue	Yellow	Yellow	Red
4	PTD or up to 3 fatalities	Major damage	Major effect	Major impact	Blue	Yellow	Yellow	Red	Red
5	More than 3 fatalities	Massive damage	Massive effect	Massive impact	Yellow	Yellow	Red	Red	Red

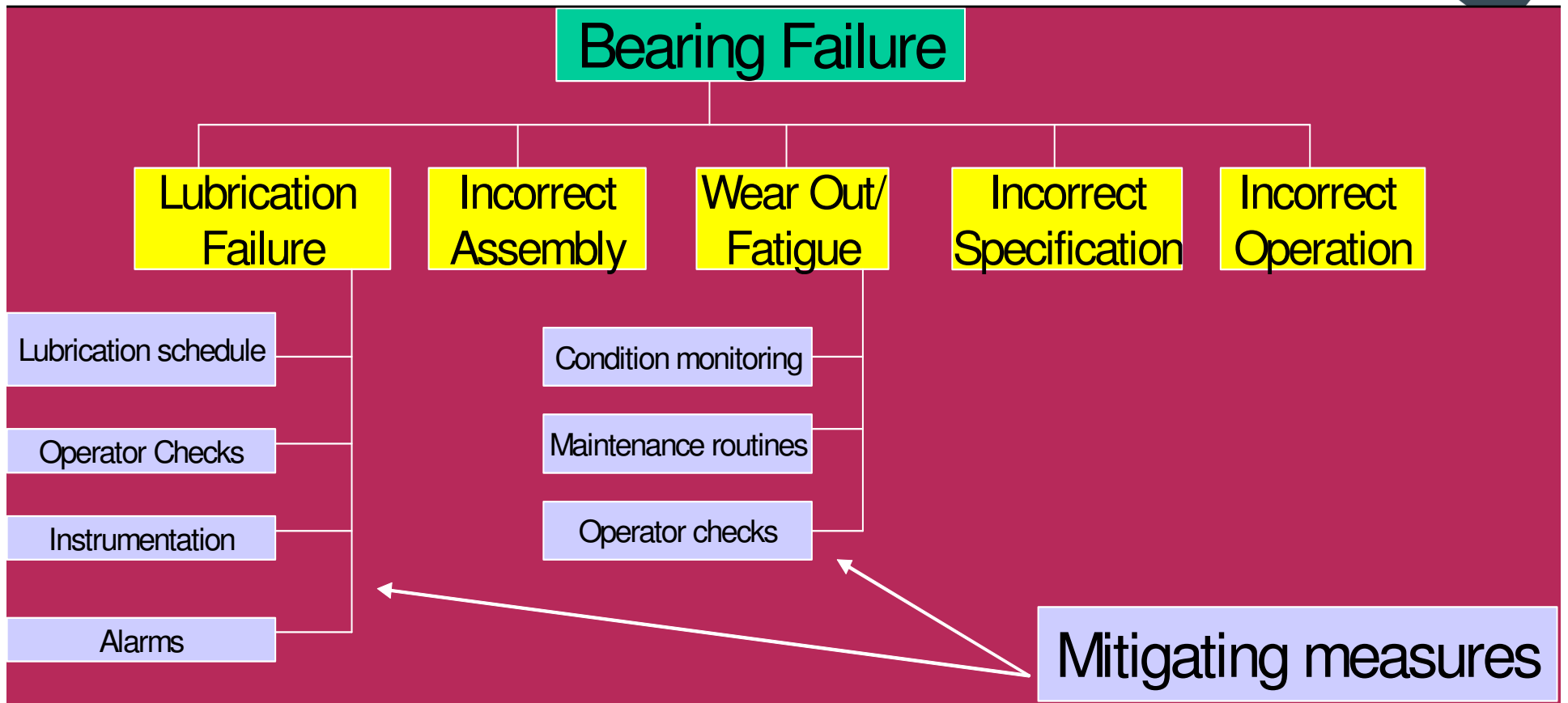
Most Frequent →

Critical assets according to risk - severity and frequency

Most suitable method of deciding
Job choice:



Risk mitigating measures & how to define them



Failure Modes and Effects – Failures description

Plant	11kV / 3.3 kV and 415 Transformers				Machine Group		Area				Unit/Equipment		
Function	To supply, contain & distribute from 11KV to 3.3kV and 415V, in a safe, controlled, environmentally contained manner.						Manufacturer				Model No.		
Unit/ Assembly	Ref. No.	Functional Failure	MODE How does it fail	EFFECT of failure	CAUSE of failure	Failure Characteristic Early Life, Random, Age	Pre-failure warning	MTBF Monthly/ Years	Type Hidden or Evident	OCC Rating	Sev Rating	RPN O*S	Mtcs Approach
Transformer	1.0	Loss of HV supply to the transformer											
	1.1		Loss of incoming supply	ACB fails to operate - see ACB analysis below									
	1.2		Transformer overheats / malfunctions	Cost of repair + possible loss of BS 7750	Cooling system fails	Random	Non-Visible	10 Yrs.	E	4	7	28	CBM
	1.3		Loss of oil from Transformer bund	Cost of repair + possible loss of BS 7750	Oil leakage	Random	Visible	5 Yrs.	E	6	8	48	CBM
	1.4		Overheating of the tank / hot-spots on tank surfaces	Loss of production due to switchover / replacement of transformer	Arcing / Open or shorted internal lead connections / change of current paths	Age	Visible	10 Yrs.	E	4	8	32	CBM
	1.5		Failure of the HV, LV and tertiary winding / trip out	Loss of production due to switchover / replacement of transformer	Insulation components failure due to inability to withstand short circuit and surge voltages including switching surges	Random	Non-visible	30 yrs.	H	1	7	7	OTF
	1.6		Failure of the HV, LV and tertiary winding	Loss of production and cost of replacement of transformer	Overstressing and inadequate cooling	Random	Non-visible	20 Yrs.	H	1	7	7	OTF
	1.7		Failure of the HV, LV and tertiary winding	Loss of production and cost of replacement of transformer	Improper implementation of protective schemes / incorrect setting	Random	Non-visible	5 Yrs.	H	6	9	54	Function test

Failure Modes and Effects – Task description

Plant	11kV / 3.3 kV and 415 Transformers					Machine Group
Function	To supply, contain & distribute from 11KV to 3.3kV and 415V, in a safe, controlled, environmentally contained manner.					
Unit/ Assembly	Ref. No.	Mtce Approach	Inspection Task Description	Frequency	Duration	Resource
Transformer	1.0					National Grid - elec. Fitter
	1.1	See ABC analysis - as below				
	1.2	CBM	Clean and inspect radiator and check operation of fans	4 Yrs.	1 D	EF
	1.3	CBM	Carry out visual check for oil leaks	W	30 mins.	Ops.
	1.4	CBM	Take gas in oil analysis for evidence of arcing, hotspots, corona, etc.	6 M	45 mins.	Lab.
	1.5	OTF	Check to confirm need to replace transformer		2 D	Engineer
	1.6	OTF	Check to confirm need to replace transformer		2 D	Engineer
	1.7	Function test	Injection test proving correct settings / operation of relays. Trip test where applicable.	4 Yrs.	2 D	Engineer

Asset Services Requirements

- Preventive maintenance – #, hours, cost
- Risk based and statutory inspections – #, hours, cost
- Basic care – operations inspection routines, hours, cost
- Reactive maintenance – hours, cost
- last 3 years and projection
- Maintenance / Facilities / Workshop etc.

Programme of Project Works for Management Site-wide

Projects – Capex / NRR – plan example

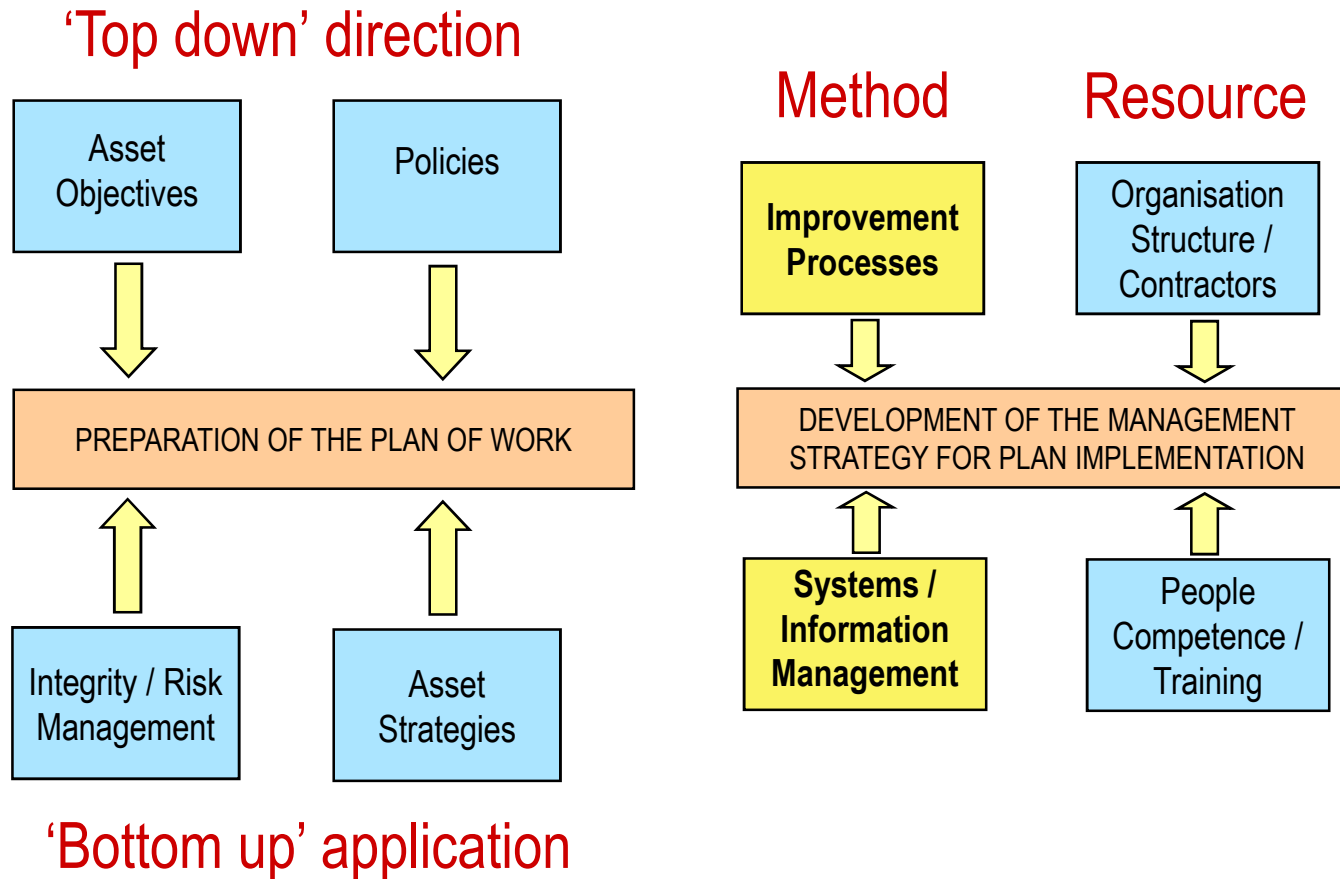
- Investments needed, eg. 115 Million HKDs to refurbish asset XXX as per Capex profile
- listed by objective – compliance to HSE, ISO 14001, etc.

Shutdowns example plan for next 10 years – duration and basic costs (without projects)

- the duration of the shutdowns
- the frequency of the shutdowns
- the coordinated plans for years ahead

Major Elements of Asset Management

- how does it work?



What to do – doing the right things

1. Planning

- people are doing the right jobs
- at the right time
- with the right materials



2. Work control

- the correctly trained people
- are carrying out the right procedures
- with the right tools



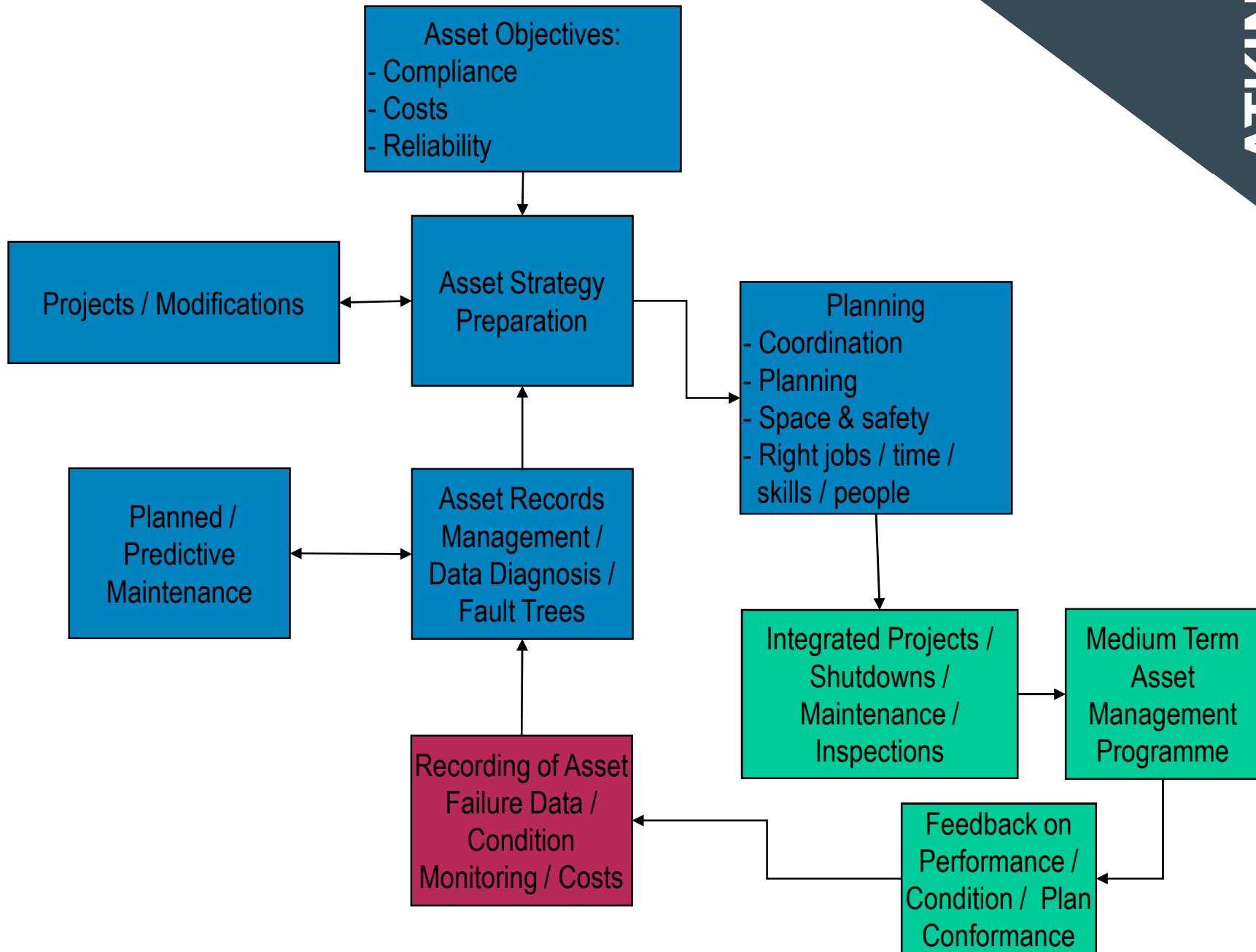
3. Continuous improvement

- analysing the right failure data
- accumulating the right costs and consequences
- focusing on the right assets, jobs and processes for the future

How to do it - a process review

- what range of processes are necessary, projects, inspections, maintenance, from justification to completion
- are the process steps agreed at a senior level?
- who is responsible for each of the steps?
- what communication, meetings, controls, supervision, monitoring is required?
- what additional skills, training, behaviours, are needed?

Asset Management Plan – Do – Check - Act

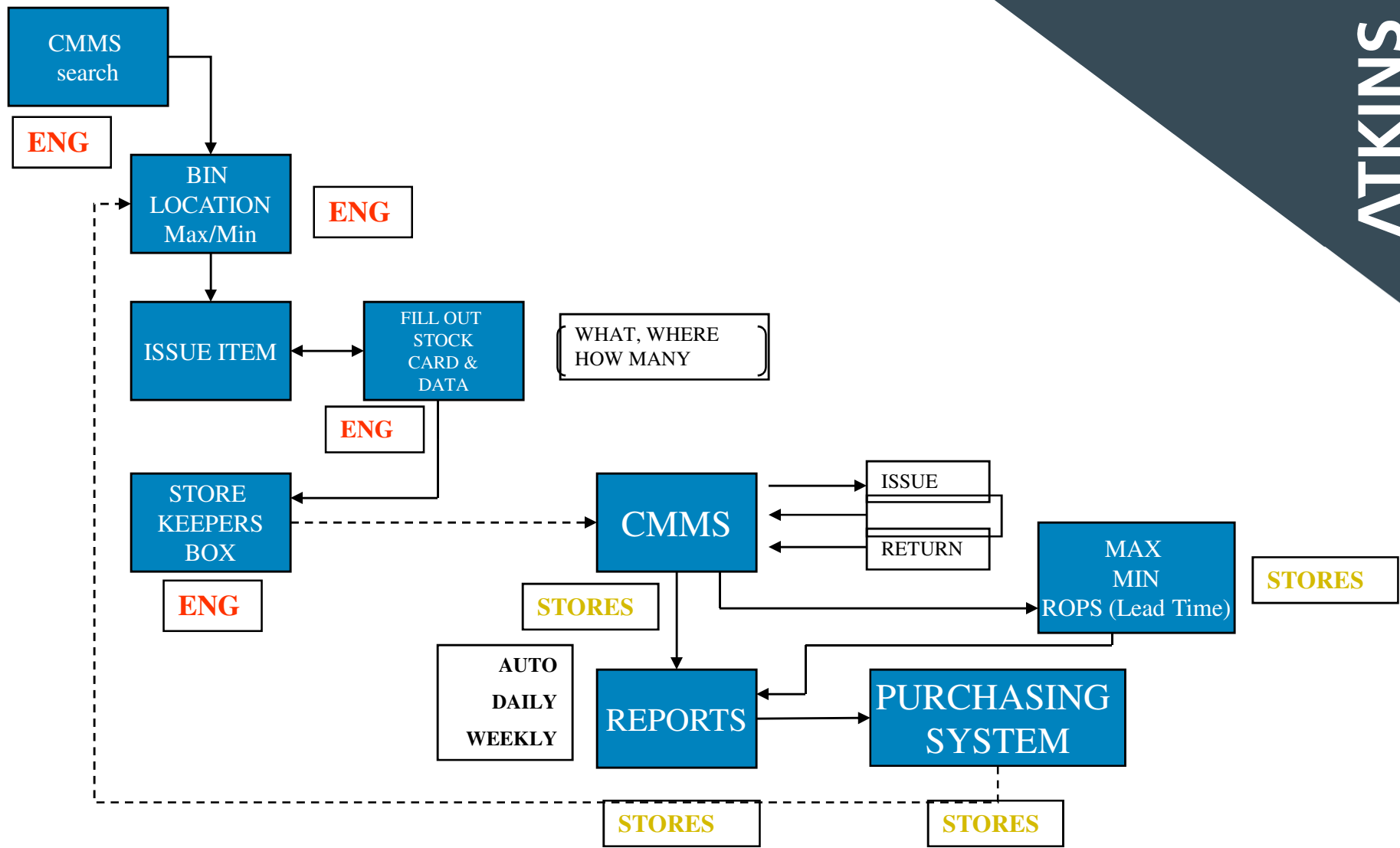


Do the Activities Safely

- Safe Systems of Work (Permit) Process

General Requirements:

- risk assessments - computer system / method statements
- focus on higher risk jobs / more hazardous working areas
- who to do the permits - job / site visits to be made?
- consistent approach across the site
- prize – fewer safety incidents, better place to work
competency / training / management system



**MODEL USED – Requisitioning /
Receiving / Reviewing**

EFNMS – Benchmarking indices

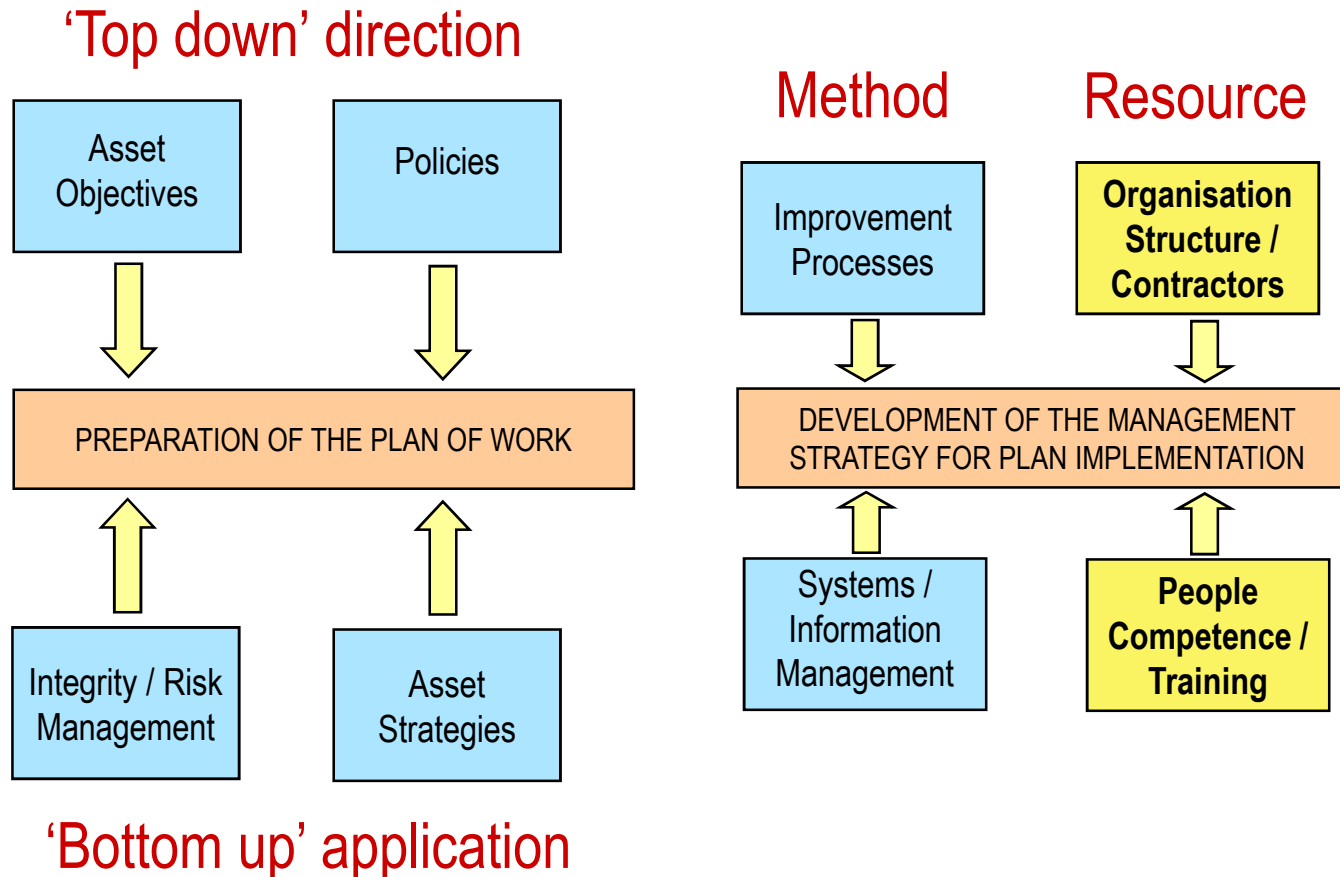
	Mean	Mean2	Unit
Plant turnover	142,4		million euros
Plant replacement value	218,1		million euros
OEE	76,4		%
Required operating time as a % of Total available time	73,6		%
Actual operating time as a % Required operating time (Availability)	88,1		%
Shift work rate	3,5		1-5
Production operatives	209,0		Number
First line maintenance operatives	41,0		Number
Maintenance costs as a % of Plant turnover	4,1	2,8	%
Maintenance costs as a % of Plant replacement value	3,0	2,0	%
Stores investments as a % of Plant replacement value	0,8	-	%
Contractor costs as a % of Maintenance costs	34,7	31,9	%
Training man hours as a % of Maintenance man hours	3,1		%
Preventive maintenance costs as a % of Maintenance costs	36,2		%
Preventive maintenance man hours as a % of Maintenance man hours	38,4		%
Corrective maintenance man hours as a % of Maintenance man hours	29,8		%
Planned and scheduled man hours as a % Maintenance man hours	63,0		%
Actual operating time / Nr of immediate corrective maintenance events	241,1		hours
Immediate corr. Maint. time / Nr of immediate corr. maint. events	6,9		hours

A systems review

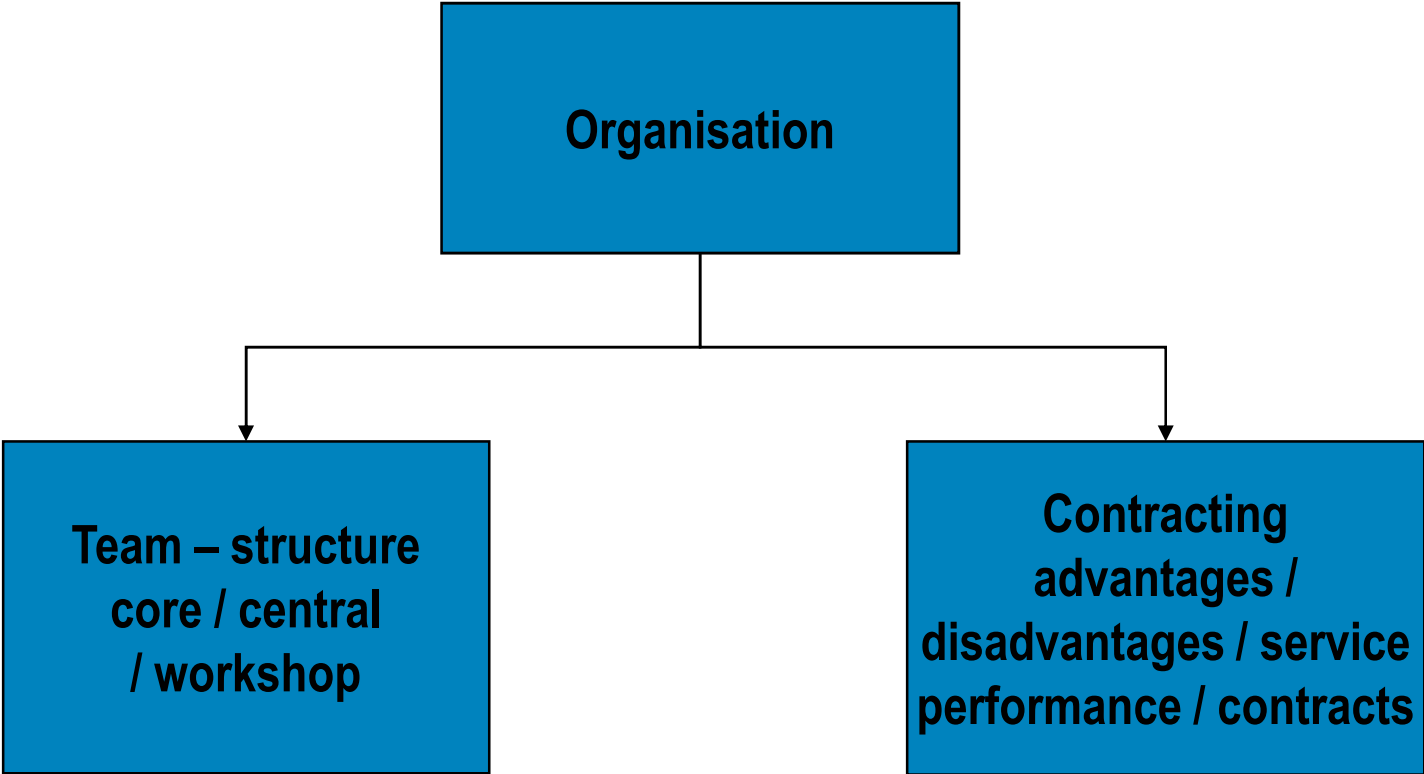
- what systems are in use, how useful / useable are they?
- what additional systems would help – can they be justified?
- what will be the additional data needs and implementation plan, including training?
- what would be the additional benefits and costs?

Major Elements of Asset Management

- how does it work?



Organisation

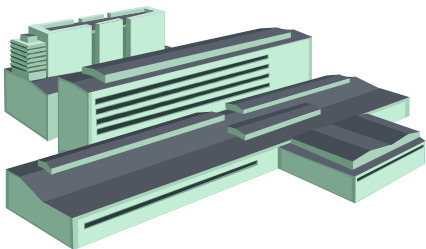


Advantages / disadvantages of outsourcing

Advantages:

- lighter organisation structure
- concentration on core business
- higher productivity of the staff
- comparison of rates of pay
- expertise of service provider

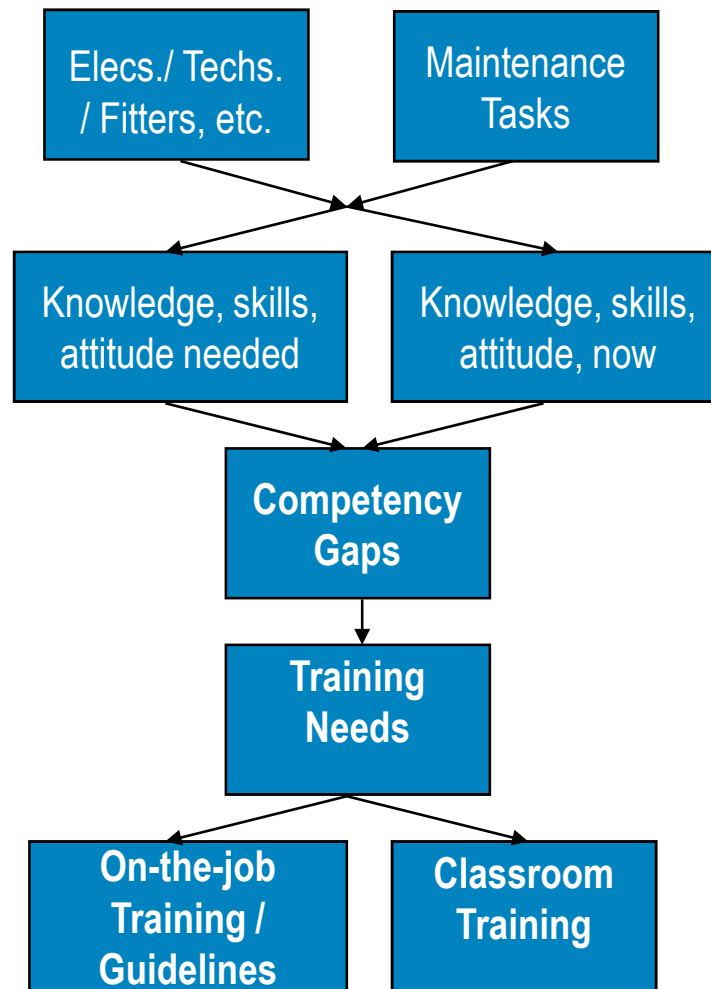
Company :



Disadvantages:

- less direct control on costs, productivity, safety, security, hygiene and continuous improvement
- loss of competence
- less care for asset longevity

Competency - Training needs analysis



Gap Analysis

– agree ‘maturity’ criteria 1-5 and score

4.2.1	Asset management policy & strategy	-----	
4.3.1	Asset management information system	-----	
4.3.2	Risk identification, assessment and control	-----	
4.3.3	Compliance with legal, regulatory, statutory requirements	-----	-----
4.3.4	Asset management objectives, performance, condition targets, and plans	-----	
4.4.1	Organisational structure and responsibilities	-----	
4.4.2	Training & competence	-----	
4.4.3	Consultation and communication	-----	
4.4.5	Documentation & information control	-----	
4.4.6	Operational control	-----	
4.4.7	Emergency preparedness and response	-----	
4.5.1	Performance measurement and monitoring	-----	
4.5.2	Asset-related failures and corrective and preventive action	-----	
4.5.3	Records management	-----	
5.4	Audit	-----	
4.6	Management review and continual improvement	-----	

How we can help in Maintenance / Facilities

ASSET STRATEGY DEVELOPMENT & PLANNING

- 1. Asset Management Audits
- 2. Training in Codes of practice & guidance documents
- 3. Key performance monitoring & benchmarking
- 5. Policies / Objectives setting
- 6. Asset register design/implementation
- 7. Risk Based Inspections / Reliability Centred maintenance, FMECA
- 8. Failure investigation
- 9. Maintenance Regimes
- 10. Procedures - inspection/maintenance
- 11. Preparation of 'Road Map' plans Management Plans and Policies

MANAGEMENT PROCESSES

- 12. Processes design and organisation
- 15. Best Practice / PAS 55 Certification – advice & training
- 16. Maintenance contracting / outsourcing
- 17. Safe Systems of Work – permit system

INFORMATION MANAGEMENT & SYSTEMS

- 18. Selection and Implementation of Maintenance Management / Inspection Systems
- 19 Site-wide recording of Engineering Information / Documentation
- 20. Life Cycle Costing