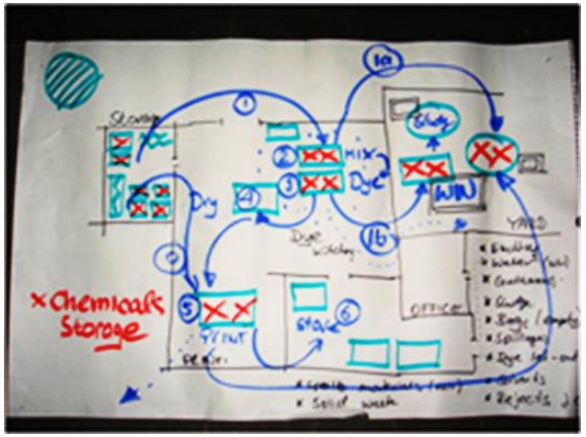
Understand the situation at hand

ANALYSING AND DOCUMENTING PROCESS AND CHEMICAL FLOWS IN YOUR COMPANY




In this session…



- Understand purpose and concept of process flow mapping
- Familiarise with practical mapping tools
  - Flow diagrams
  - Eco-mapping
- Exercise
- Plan your next steps

Purpose of process flow mapping

- To lay ground work for inventorying of chemicals and establishing chemical management system framework for promoting responsible usage and prevention of adverse impacts on environment, health and safety as well as losses
- To support identification and documentation of hazard/risks related to entire range of production processes, products, non-product outputs (NPO) activities under purview of your company




ZDHC CMS references

- ZDHC CMS 2.1. - Systematically identify and document chemicals used and stored in your organisation
  - 2.1.2 Facility Plan and Walk Through; expected CMS deliverable: Factory plan depicting areas with chemical storage and usage.
  - 2.1.3 Chemical Material Flow Diagrams
  - 2.1.4.1.1 Accurate Chemical Inventory Using Mass Balance

Concept of process flow mapping

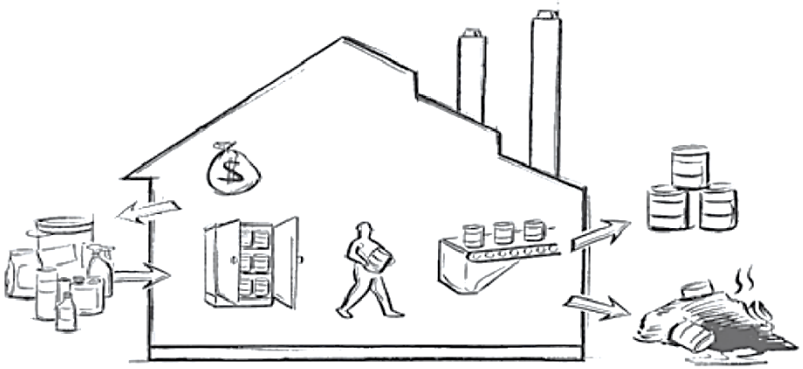
- Apply systematic step-by-step approach towards understanding process and chemical flows;
- Understand where chemicals and chemical (containing) wastes are present and stored within your site;
- Set boundaries regarding external operations that your company can/should/wants to influence
  - For example
  - Procurement of chemicals and products containing chemicals
  - Transport/shipment and delivery of products and chemicals to/from company as
  - Disposal of waste products (air emissions, solid waste, waste water)




Mapping your processes and chemical flows

Important: Set the boundaries of your system

Procurement
Delivery
Reception/ unloading
Storage
Packing/ repacking
Laboratory testing



Product warehouse
Product Loading
Product transport/ shipment and distribution
Product use and final disposal

Emission control
Treatment and disposal of waste
Other…

Internal transfer
Formulation/Mixing
Dosing
Production

Internal waste collection and removal
Maintenance

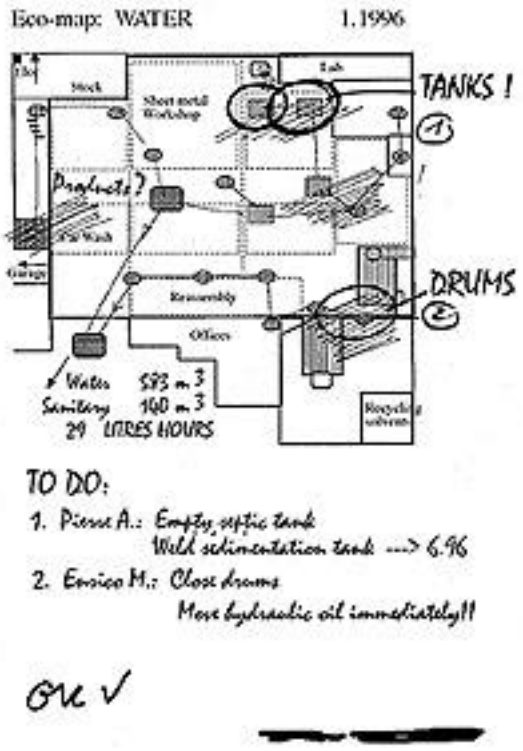
Benefits of process flow mapping

- Gain general overview of production process
- Identify all relevant process steps, intermediary products, most important and/or critical materials
- Create basis for
  - systematically analysing of inputs and outputs (both desired products and NPOs/wastes)
  - visualizing quantities and costs (for mass balancing)
  - documenting hazards/risks and areas with chemicals and process of concern
- Localize optimization potentials and areas
- Improve process communication inside your company
- Establish reference for planning, monitoring and reporting

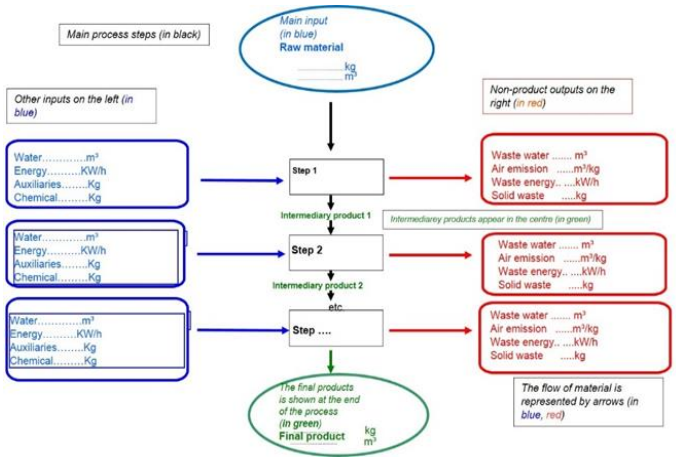



Practical mapping tools

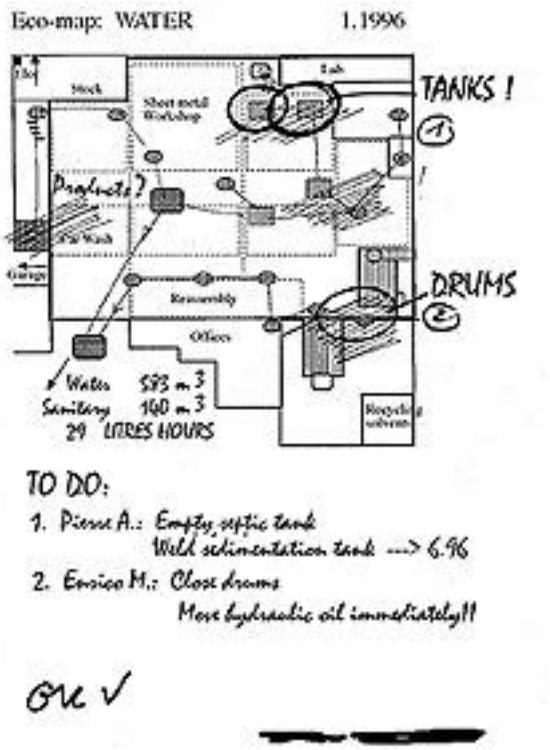
Eco-mapping



Process flow diagram



Eco-mapping



- simple, practical tool for visualization of process flows
- good to use in resource efficiency, OSH and/or chemical management for
  - identifying and documenting the prevalent situation and issues
  - identifying and analysing common issues and priority
  - selecting and planning areas for improvement
  - monitoring progress of implementation
  - auditing and reporting

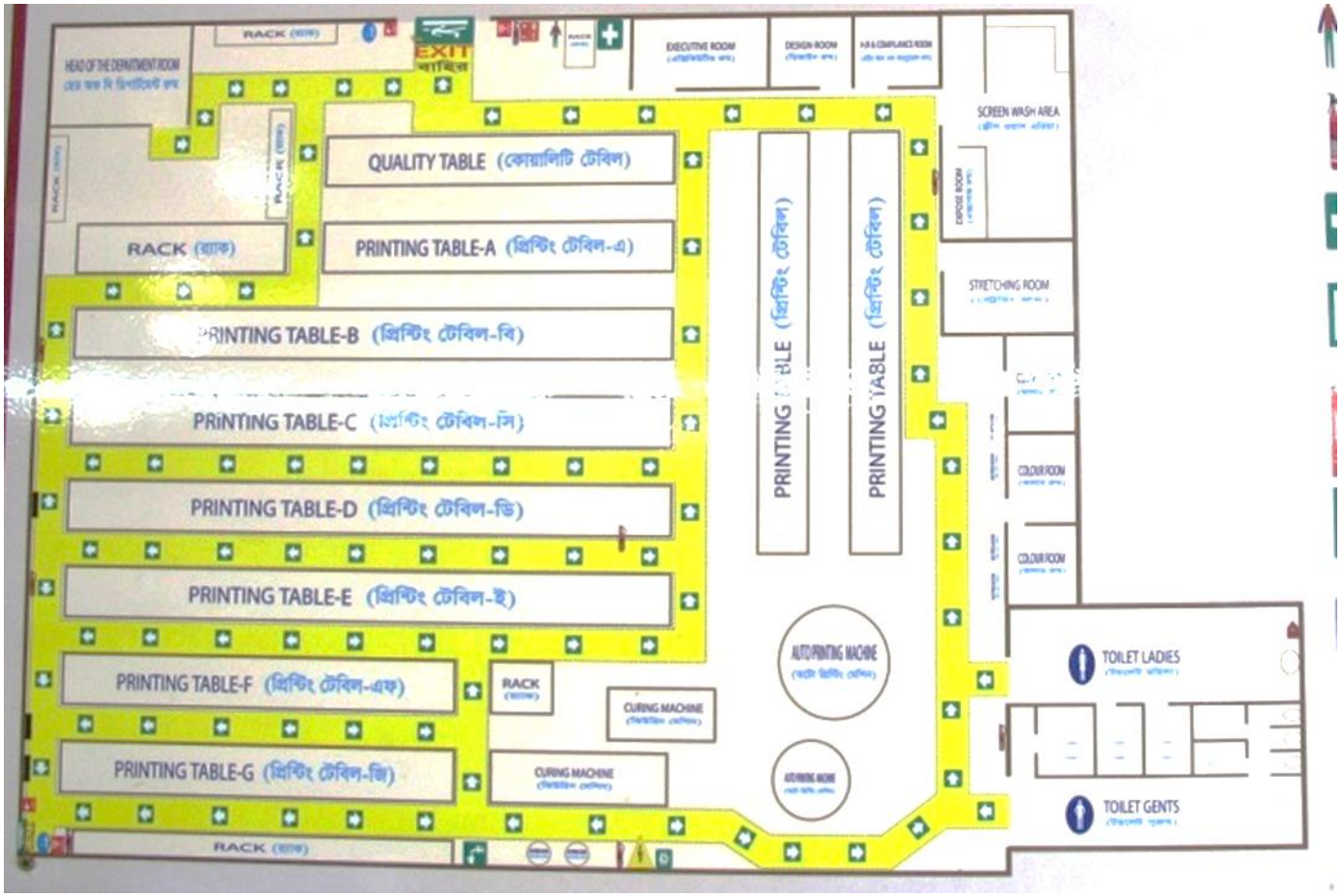



How to proceed

- Use existing ground and floor plans to facilitate identification and visualization of environmental problems (“critical situations/ hot spots”) within a company
- Consider using different maps to create a useful multi layer set of graphical information (e.g. for chemicals, water, energy, air, wastes)
- Prepare or verify during an initial company/site walk-through
- Collect and fill in additional information, using guiding questions and observations on site

Involve staff and workers on-site in different processes or production areas

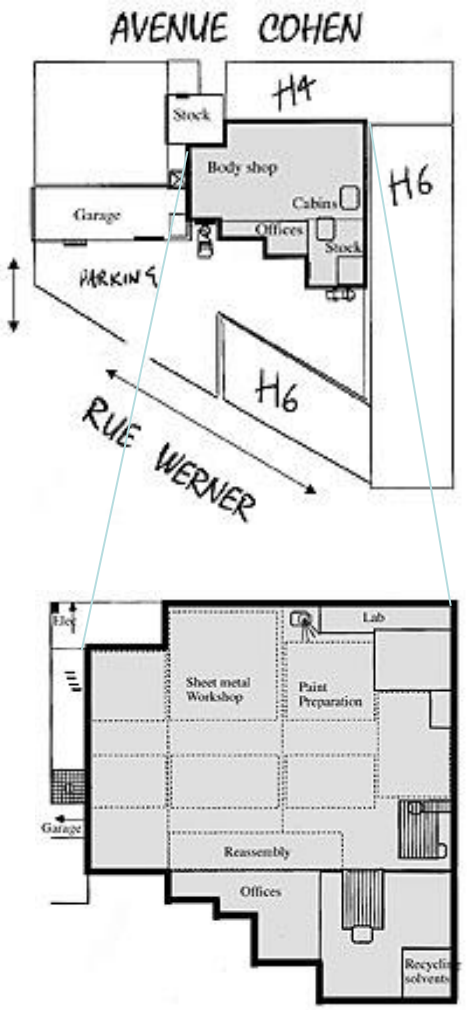
How to proceed






Practical tips

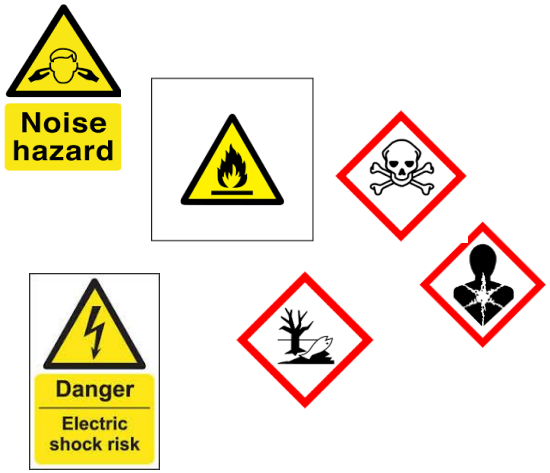
- Also take into consideration general location of your company in the area
  - Any water bodies around the compound?
  - Housing areas? Schools?
  - Neighbouring industries?
  - Roads used by company
  - Other…



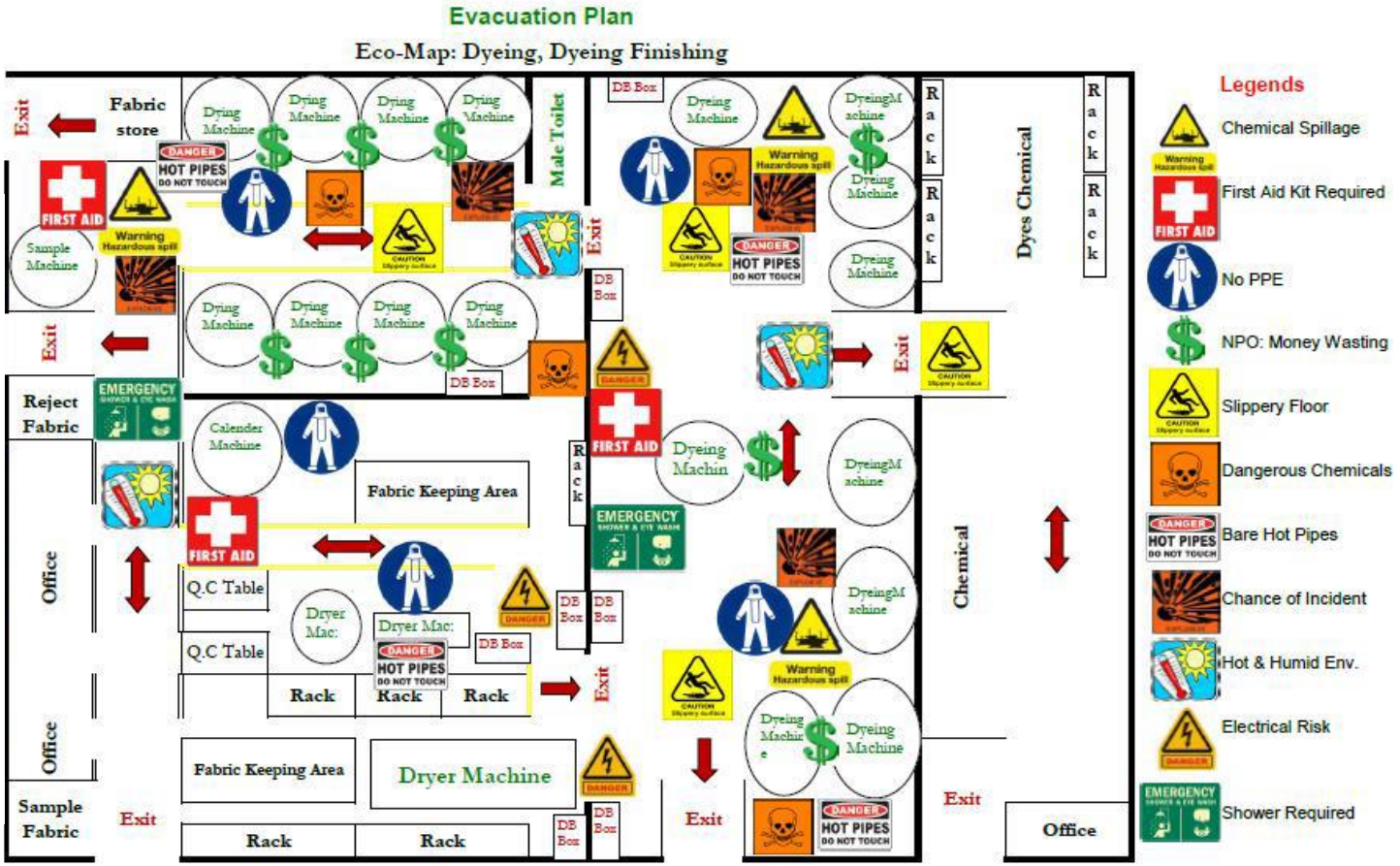



Practical tips

- Decide and agree on your own standard symbols beforehand
- Use consistently in all maps
- Indicate gravity of observed “hotspots”
  - Hatched lines: small problem (area to be monitored, problem to be studied)
  - Circle: large problem (stop, corrective action)
  - The more serious the problem: the thicker or larger the circle or symbol



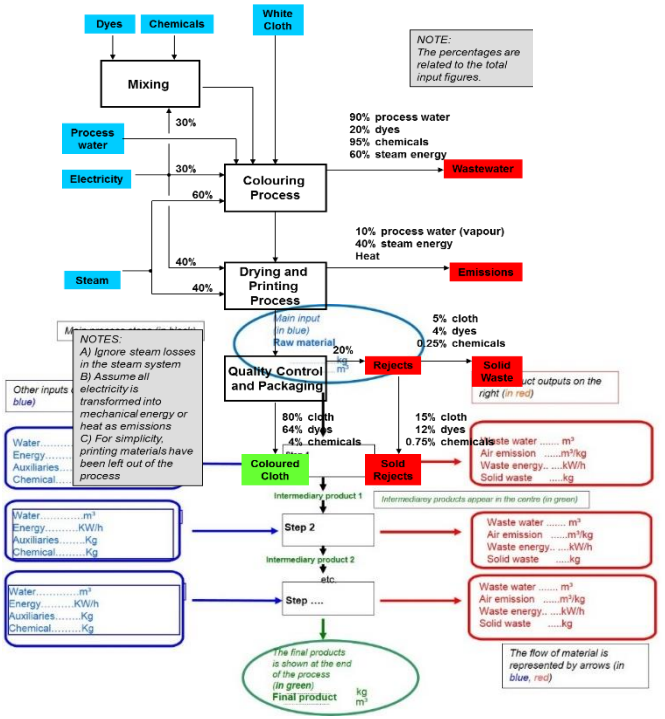
Example: Textile unit, Narayanganj, Bangladesh



Process flow diagrams

Used to

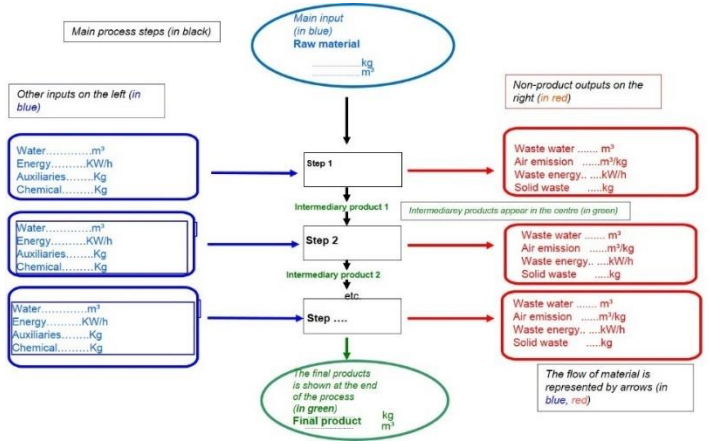
- Document…
  - Processes/process steps
  - Interconnection between process steps
  - Process inputs
  - Intermediary and final products
  - Non-product outputs (NPOs)
- prepare mass balance and/or cost analysis
  - Indicate quantifies and/or value of inputs, outputs, non-product outputs





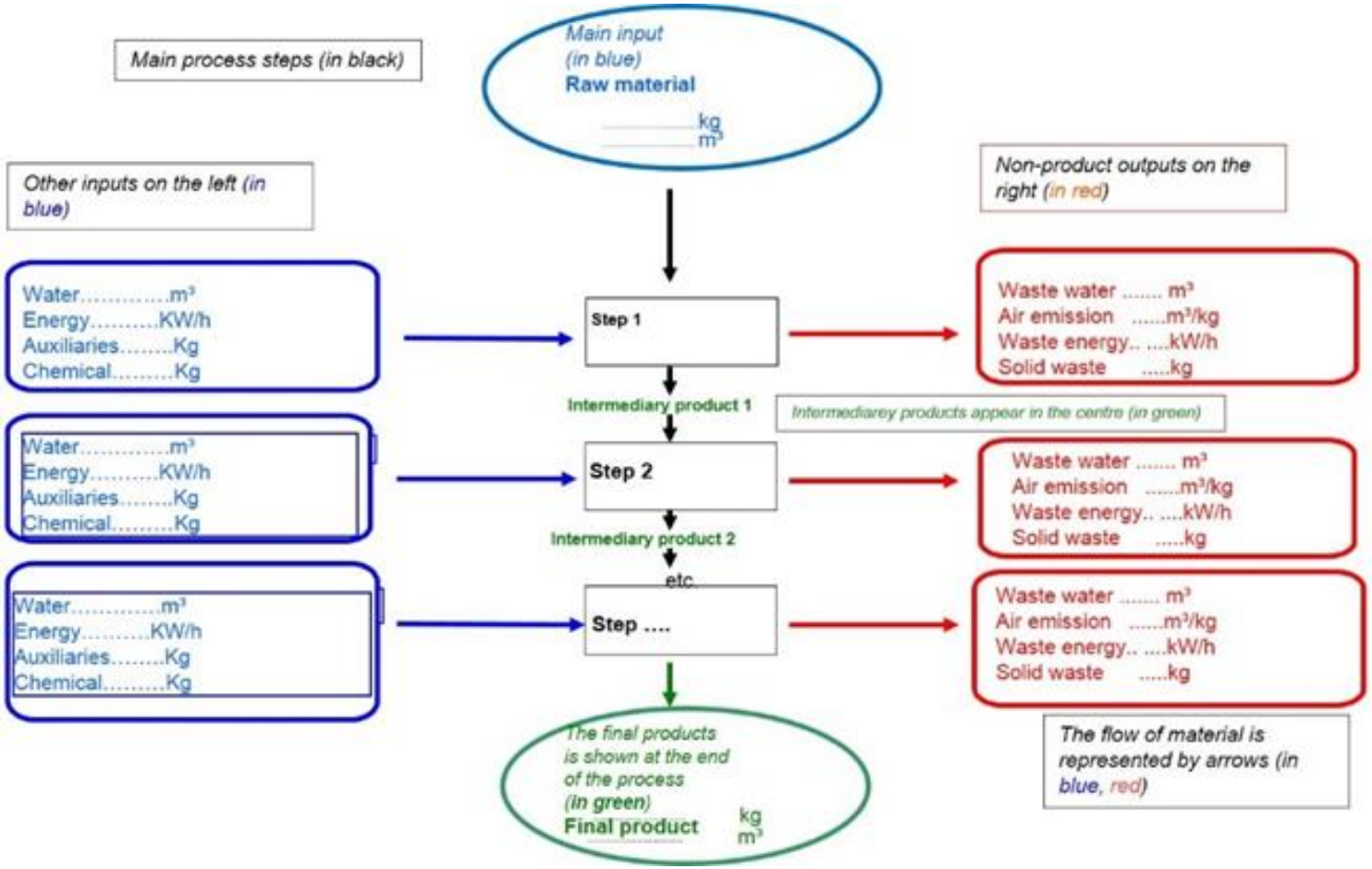

Practical tips

- Processes/process steps represented by squares
- Flows represented by arrows
- Inputs (raw materials, water, energy, chemicals) on one side
- Main input comes from above
- Intermediary products located below each process
- NPOs as output to right side
- Final product leaving process






Practical tips






Non-Product Output (NPO)

NPO Arrow

Source: GTZ, 2005




Non-Product Outputs - examples 1

Cut offs of raw material,
e.g. finished leather scraps, textile cuttings

Process water and chemicals




Non-product Outputs - examples 2

Energy - Wasted steam

Excess use of electrical energy due to poor connections

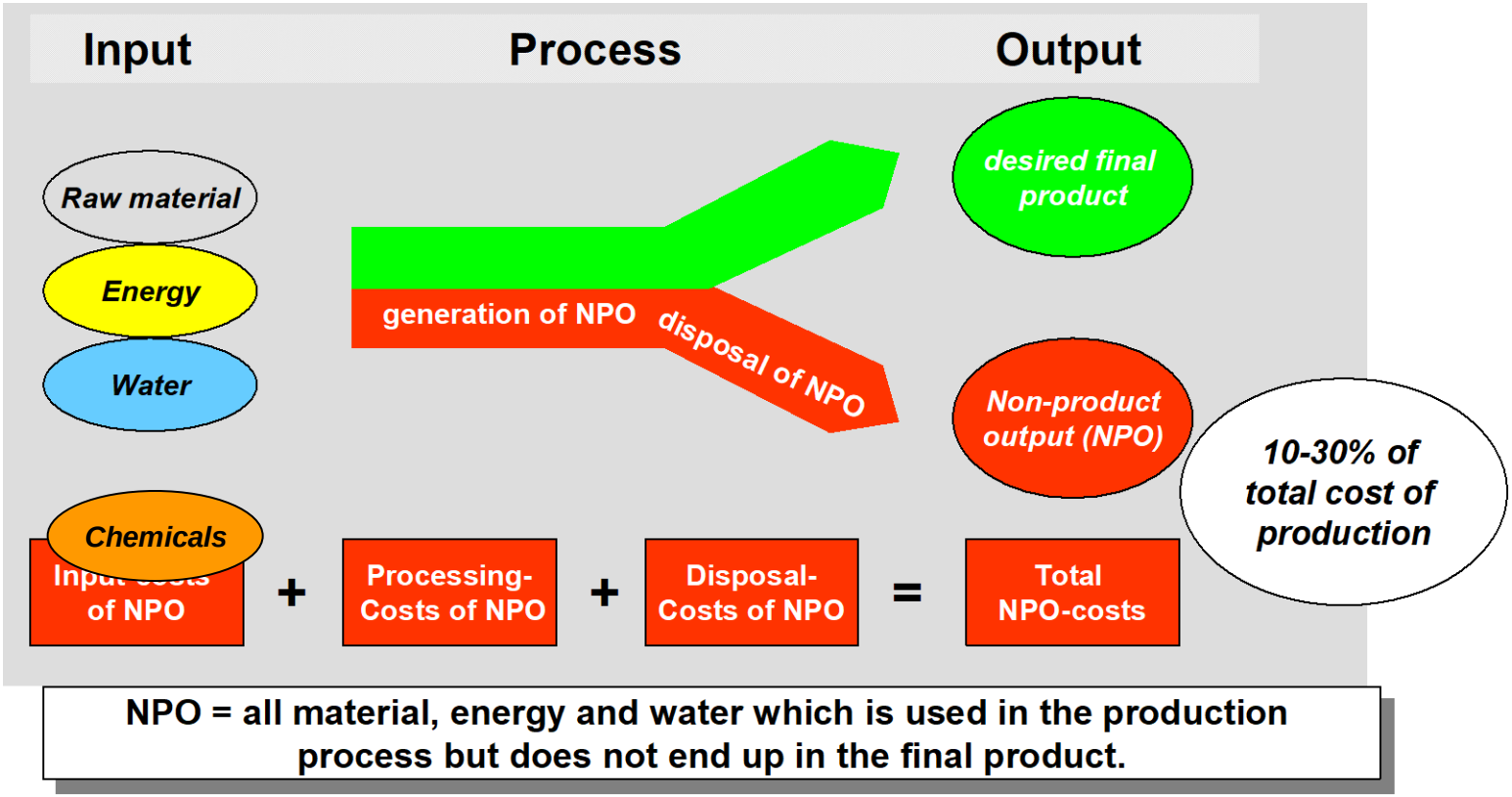



Non product outputs – examples 3

Leaking pipe connections

Lost heat energy from hot water in cooling systems

Non-product outputs = Potential for extra profits

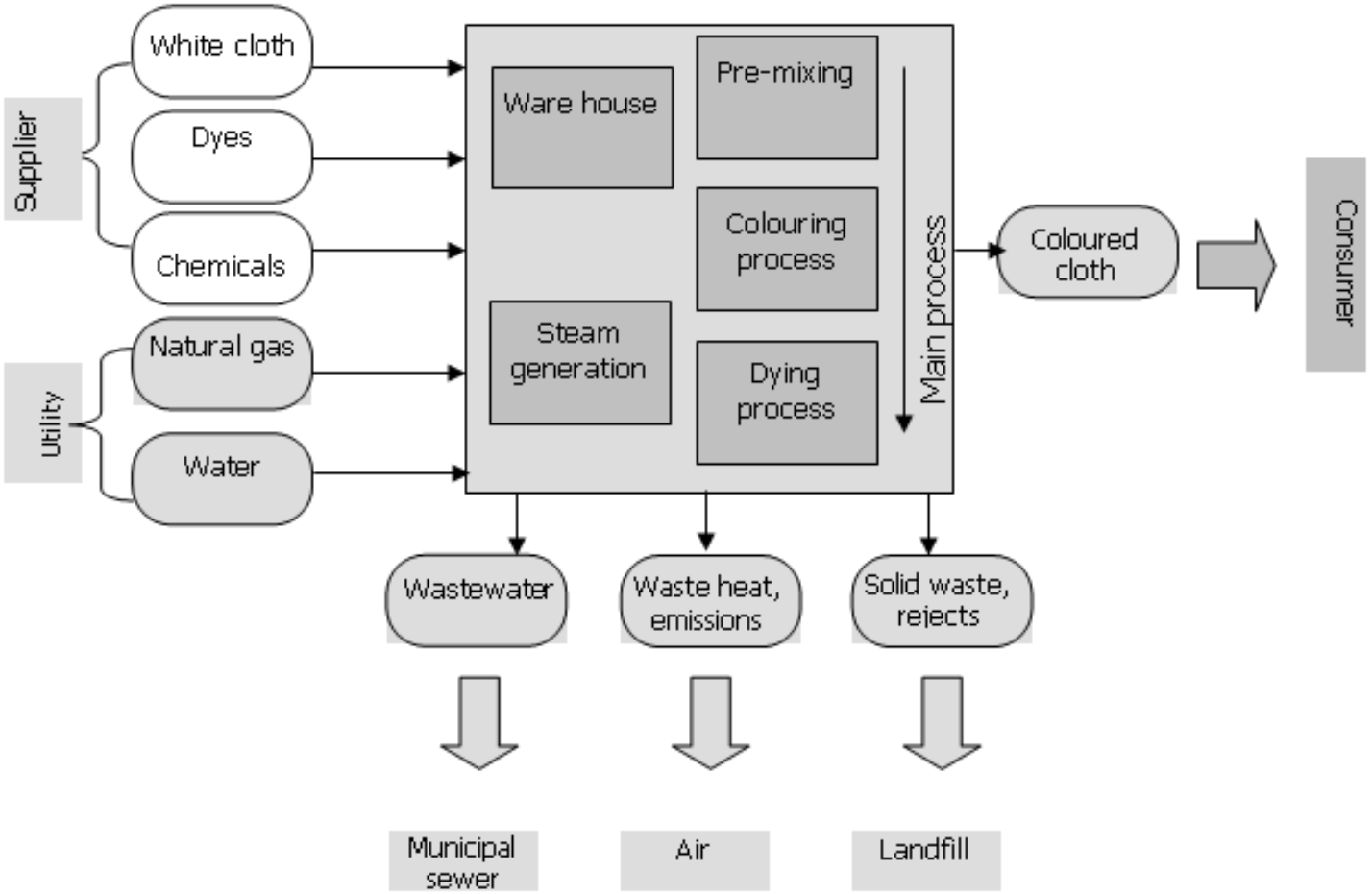


NPO Arrow

Source: GTZ, 2005




First get an overview ...



Source: UNEP RP

… then a blow up of major process steps...

white cloth >
dyes
chemicals
water
steam

→

Colouring process

(5 vessels)

→

coloured cloth
dyes
chemicals in cloth
moisture in cloth

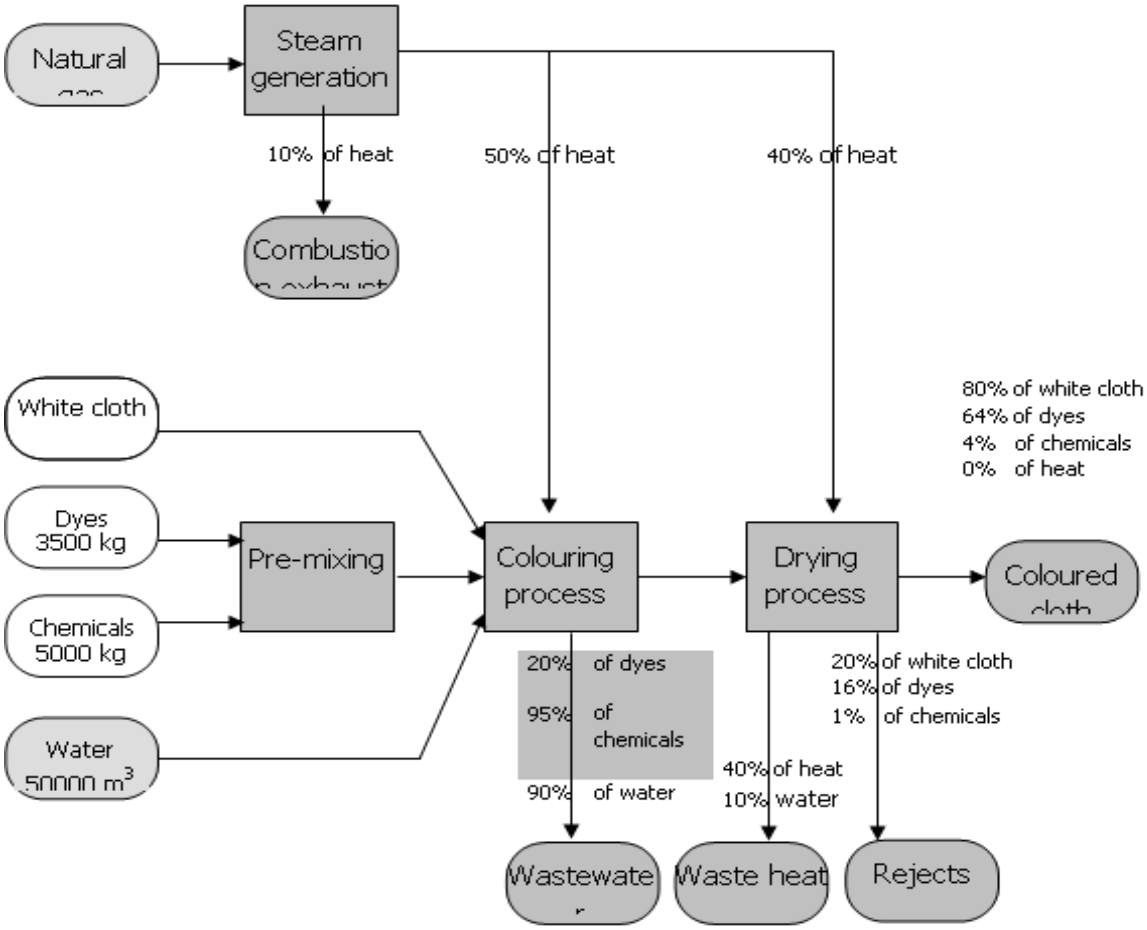
↓

Wastewater
dyes/chemicals (in wastewater)
heat/energy (in wastewater)

Source: UNEP RP




… and finally allocate percentages and absolute quantities to flows...



Source: UNEP RP




Exercise

Objective

- To practice identifying and mapping chemical flows and locations in your company`s operations
  - using tools such as flow diagrams and eco-maps for visualisation and documentation

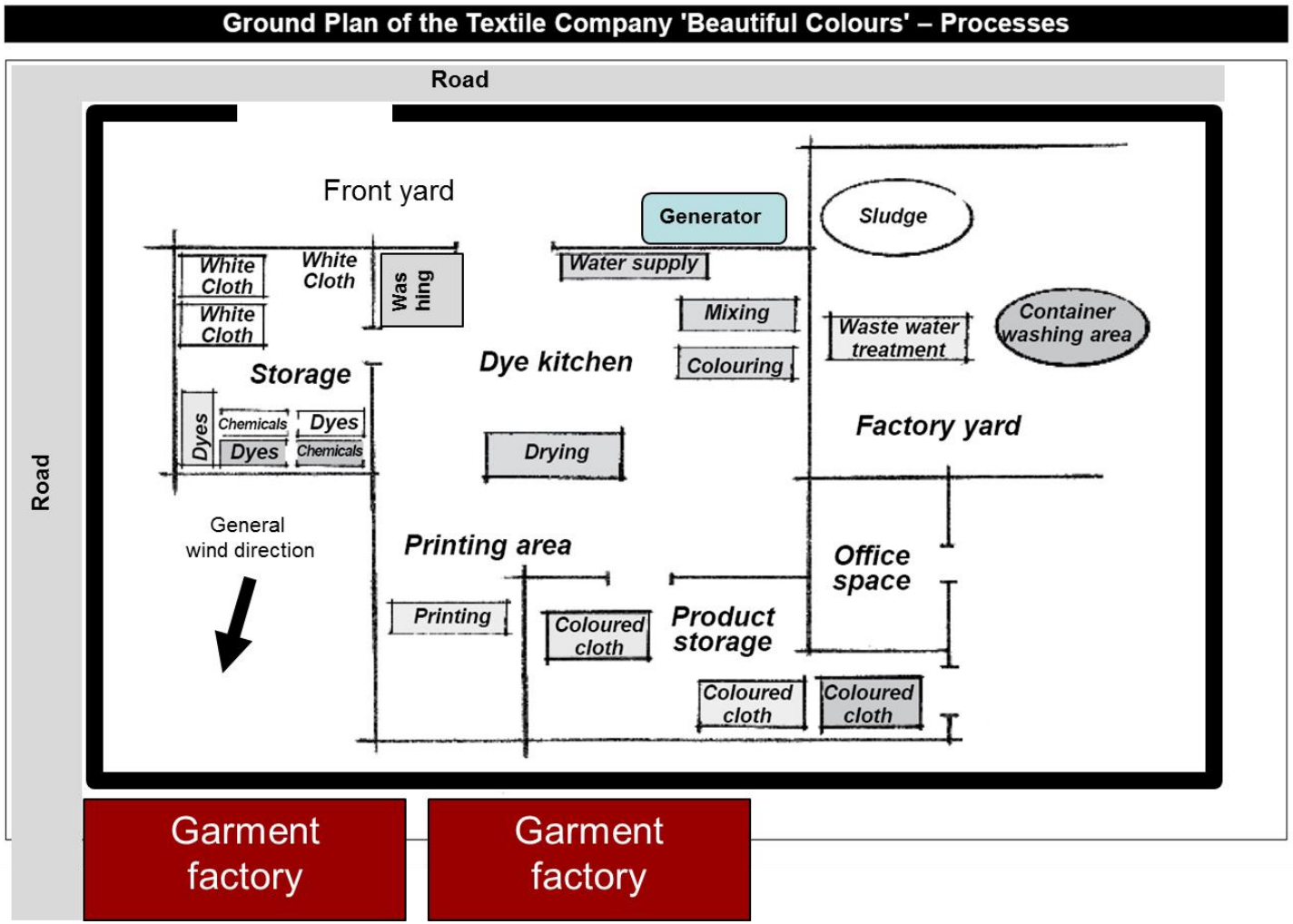



Exercise

Welcome to Beautiful Colours
Textile Company




Exercise


Ground Plan of the Textile Company 'Beautiful Colours' – Processes
Road
Front yard
White Cloth
White Cloth
White Cloth
Was hing
Storage
Dyes
Chemicals
Dyes
Dyes
Chemicals
General wind direction
Road
Dye kitchen
Generator
Water supply
Mixing
Colouring
Drying
Sludge
Waste water treatment
Container washing area
Factory yard
Printing area
Printing
Coloured cloth
Product storage
Office space
Coloured cloth
Coloured cloth
River
Garment factory
Garment factory




Washing



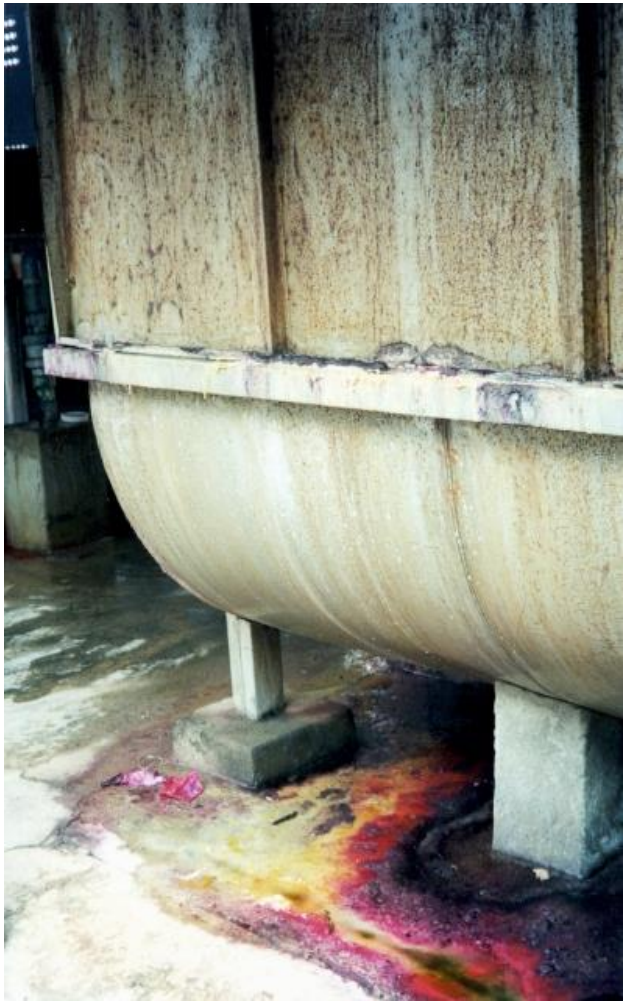

Pre-treatment




Dyeing




Dyeing






Exercise

Your task in groups

- Review information provided to you
- Identify the location and flows of chemicals and chemical (containing) waste
- Document process flow
- Recognise and point out possible NPOs and chemical hotspots (defined as areas which pose immediate risk to environment and health)
- Identify the internal key stake holders and decide who should be involved into the company`s chemical management change team
- Present you finding to the management (plenum) – one process flow diagram, one eco-map

Total time 60 minutes

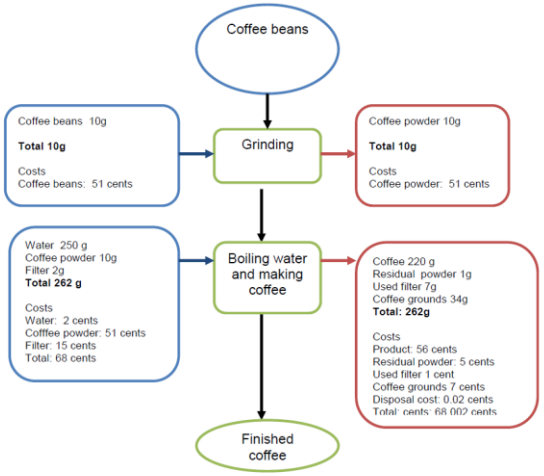
Exercise

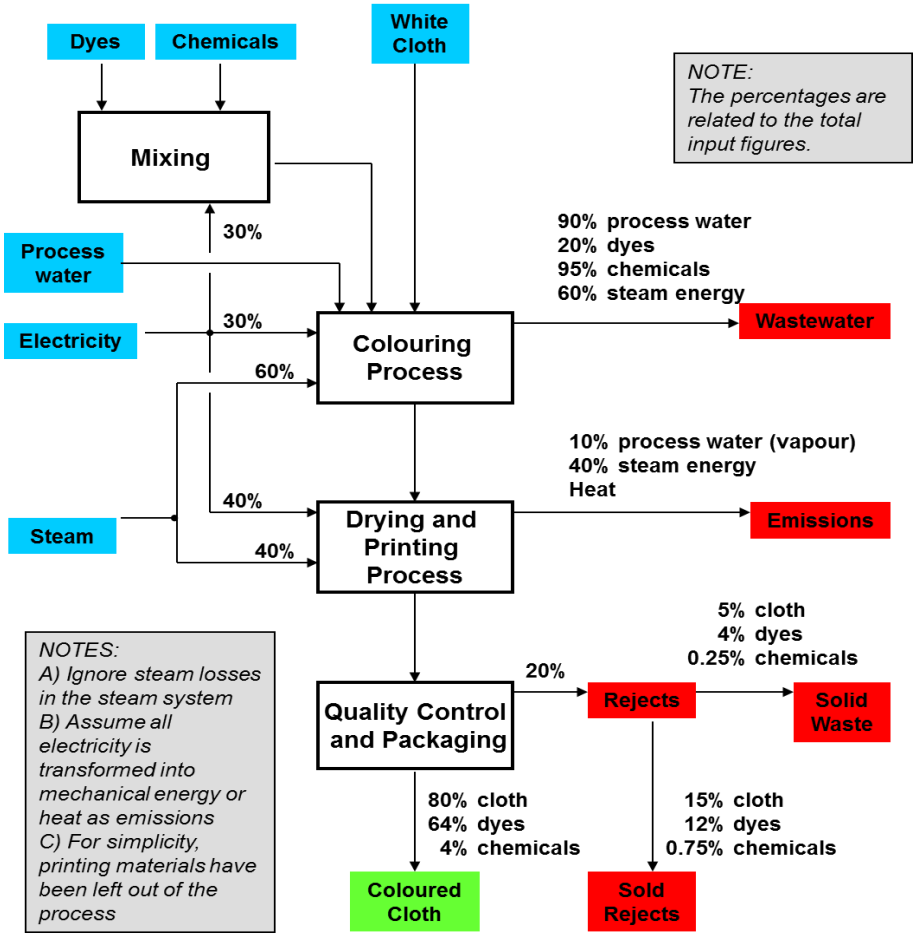
For further consideration regarding NPOs

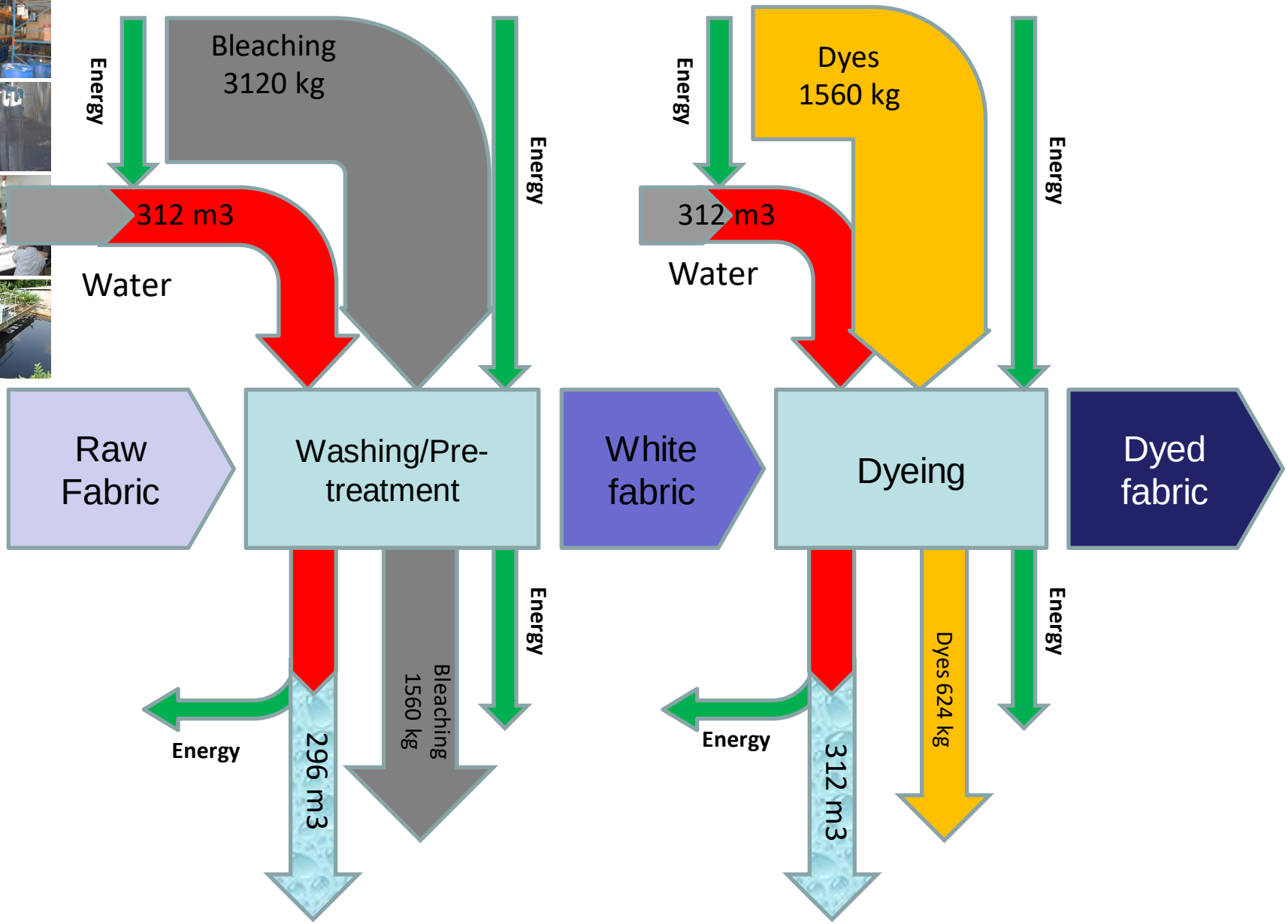
- Which inputs (raw materials, energy, water, others) are used in production process?
- Which of these inputs do not end up in the final product (i.e. are Non-Product Output)?
- Who is directly or indirectly involved in the generation and handling of which of these NPOs?
- What are the potential environmental, safety & health impacts of these NPOs?
- Which types of costs are caused by the NPOs?
- Which information is required inside the company to quantify the costs of NPOs?




Using your flowchart information







Input/Output flow – Sankey Diagram, by quantities

Energy

Bleaching

Energy kJ

Water

Energy

Dyes

Energy

Water

Raw Fabric

Washing/Pre-treatment

White fabric

Dyeing

Dyed fabric

Energy

Bleaching

Energy

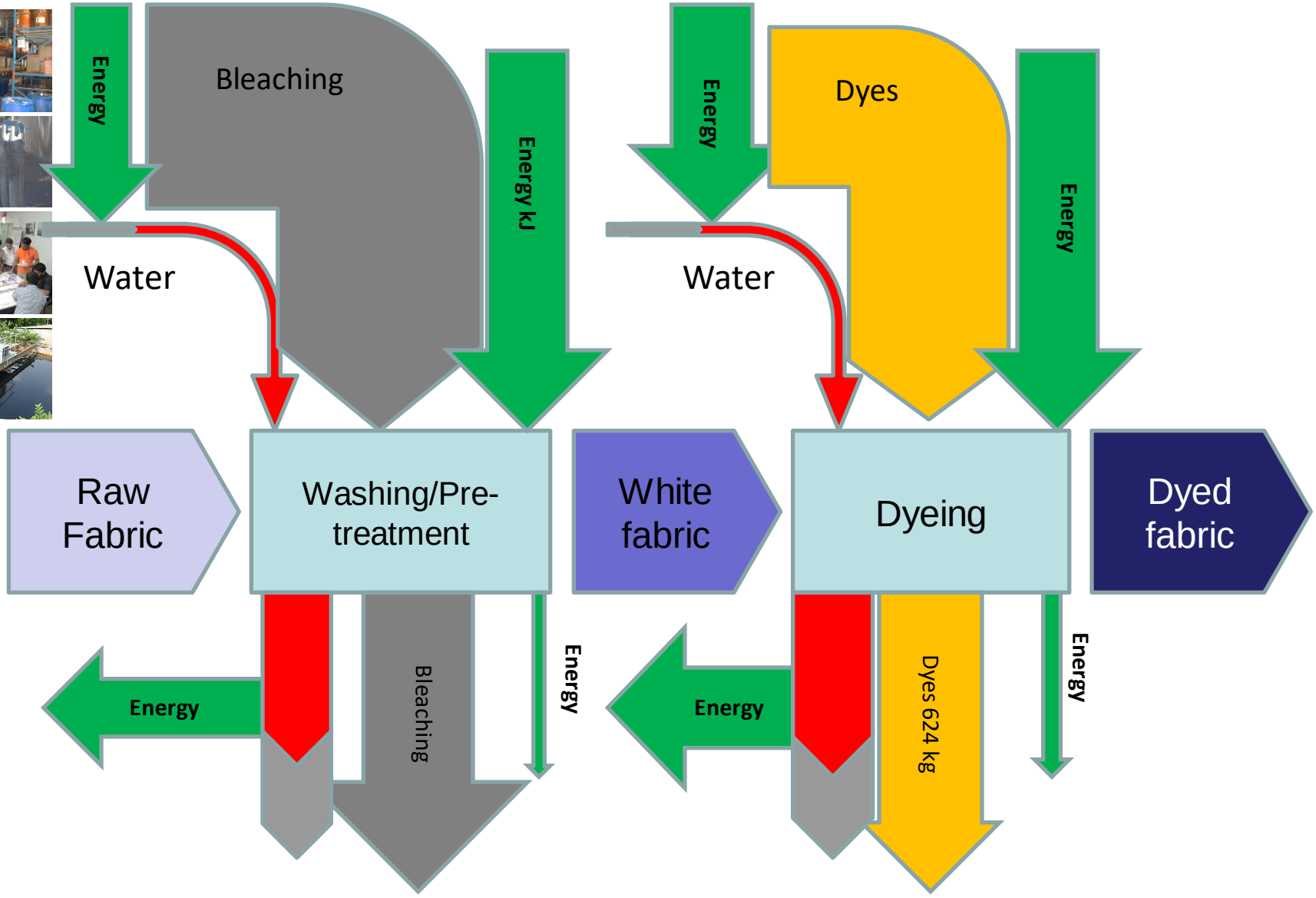
Energy

Dyes 624 kg

Energy

Input/Output flow – Sankey Diagram, by value



Input/Output flow – Sankey Diagram, by value




Plan your next steps

- Conduct company/site walk-through
  - Consider using ZDHC walk-through inspections sheet
- Prepare eco-map(s)
  - Involve your staff and workers on-site
- Compile process flow diagram
  - showing inputs, outputs, processes, process boundaries, products and non-product outputs