

# Methodology of a Cleaner Production In-Plant Assessment

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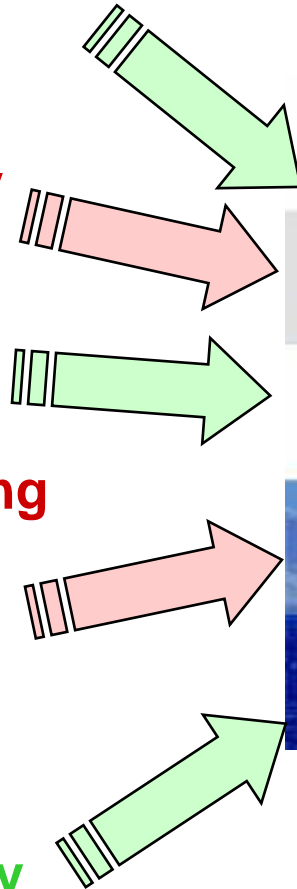
### Project implementation agency:

FHNW – University of Applied Sciences Northwestern  
Switzerland  
Institute for Ecopreneurship  
Grüdenstrasse 40; CH-4132 Muttenz – Switzerland  
[www.fhnw.ch](http://www.fhnw.ch)



# The 12 aims for sustainable tourism

1. **Economic Viability**
2. **Local Prosperity**
3. **Employment Quality**
4. **Social Equity**
5. **Visitor Fulfilment**
6. **Local Control**
7. **Community Wellbeing**
8. **Cultural Richness**
9. **Physical Integrity**
10. **Biological Diversity**
11. **Resource Efficiency**
12. **Environmental Purity**



Source: WTO-UNEP (2005): *Making Tourism More Sustainable: A Guide for Policy Makers*

# Tourism: multiple initiatives

**Association / NGOs**

**AITO (Association of Independent Tour Operators: responsible tourism guidelines**  
**([www.aito.co.uk](http://www.aito.co.uk))**

**Green Globe**

**Green Tourism Association**  
**([ww.greentourism.ca](http://ww.greentourism.ca))**

**Tour operator initiative (TOI)**  
**[www.toinitiative.org](http://www.toinitiative.org)**

**Travelife.eu**

**World Tourism Organisation Global**  
**Code of Ethics for Tourisme)**  
**[www.world-tourisme.org](http://www.world-tourisme.org)**

**Codes of conducts**  
**Industry**

**Accor: Environmental Hotel**  
**Charter Sustainability Policy**

**Hotel Plan: Environmental**  
**Reports**

**Kuoni Group: environmental**  
**policy, ecofriendly hotels**

**TUI: environmental reporting**

**Country initiatives**

**Brazil Sustainable Tourism**  
**Certification Program**

**South Africa: Fair Trade in**  
**Tourism**

**Costa Rica: CST**

## Example:



[www.travelife.eu](http://www.travelife.eu)

- **Major Tour Operators participate**
- **Supports sustainability principles within Tour Operator Sector**
- **Goals are to increase:**
  - The quality of travel products
  - Customer satisfaction
  - The quality of life in your destinations
- **Co-operation (between tour operators themselves, with their suppliers, with people at destination)**
- **Provides standardized approaches and tools:**
  - Management system (standard)
  - Training
  - Action Planning System
  - Suppliers Assessment



# Certification:



Red Sea  
Sharm el-Sheikh

**Golden Resort & Family Aquafun**

★★★★★ Gold Award  
Sustainability

all inclusive  
close to the beach  
free kids  
holiday soccer school

Your opinion

Holiday overall	100%
Accommodation	100%
Location	100%
Meals	100%

Customer gives a gold or better rating 9/10/2008

All about water, this popular hotel has massive pools and an amazing free waterpark, with slides, a kids' splash park, a fun wave pool and a lazy river. If you want to escape the excitement, there's a quieter side to the hotel, with more relaxing water features.

**Accommodation**  
Airport transfer approx. 20hrs  
Distance to beach 350m

All inclusive:  
Standard rooms sleep up to 3 adults or 2 adults and 2 children with a king-size bed or 2 queen-size beds and private facilities, air conditioning, mini-fridge, safe, TV and a balcony or terrace with garden view or pool view.  
Interconnecting rooms and Select rooms are available at a supplement.  
Family Aquafun rooms sleep up to 4 adults or 2 adults and 2 children with double bed and sofa beds in a separate lounge area. These rooms are located next to the waterpark, in the Family Aquafun part of the hotel.

Main Facilities  
Special Offers

# What is Cleaner Production (CP) ?



CP is the continuous application of an integrated, preventive strategy to processes, products and services to increase efficiency and reduce risks to humans and the environment.

UNEP 1994

„An Ounce of Prevention is Worth a Pound of Cure“

D. Huisings, Journal of Cleaner Production

“Can you see anything valuable?”  
“BASF can. They turn their waste into vital resources.”



BASF believe in making optimum use of all their resources, including waste products. Their site at Ludwigshafen, Germany - the largest chemicals manufacturing complex in the world - has 350 production units. Just think of the waste...minimal, as it happens, thanks to Verbund, BASF's concept of integrated manufacturing. Waste from one plant is used as raw material for the next. Surplus energy is also reused. That means more efficient use of resources, fewer emissions and less pollution. That's the principle on which BASF production plants work - worldwide.

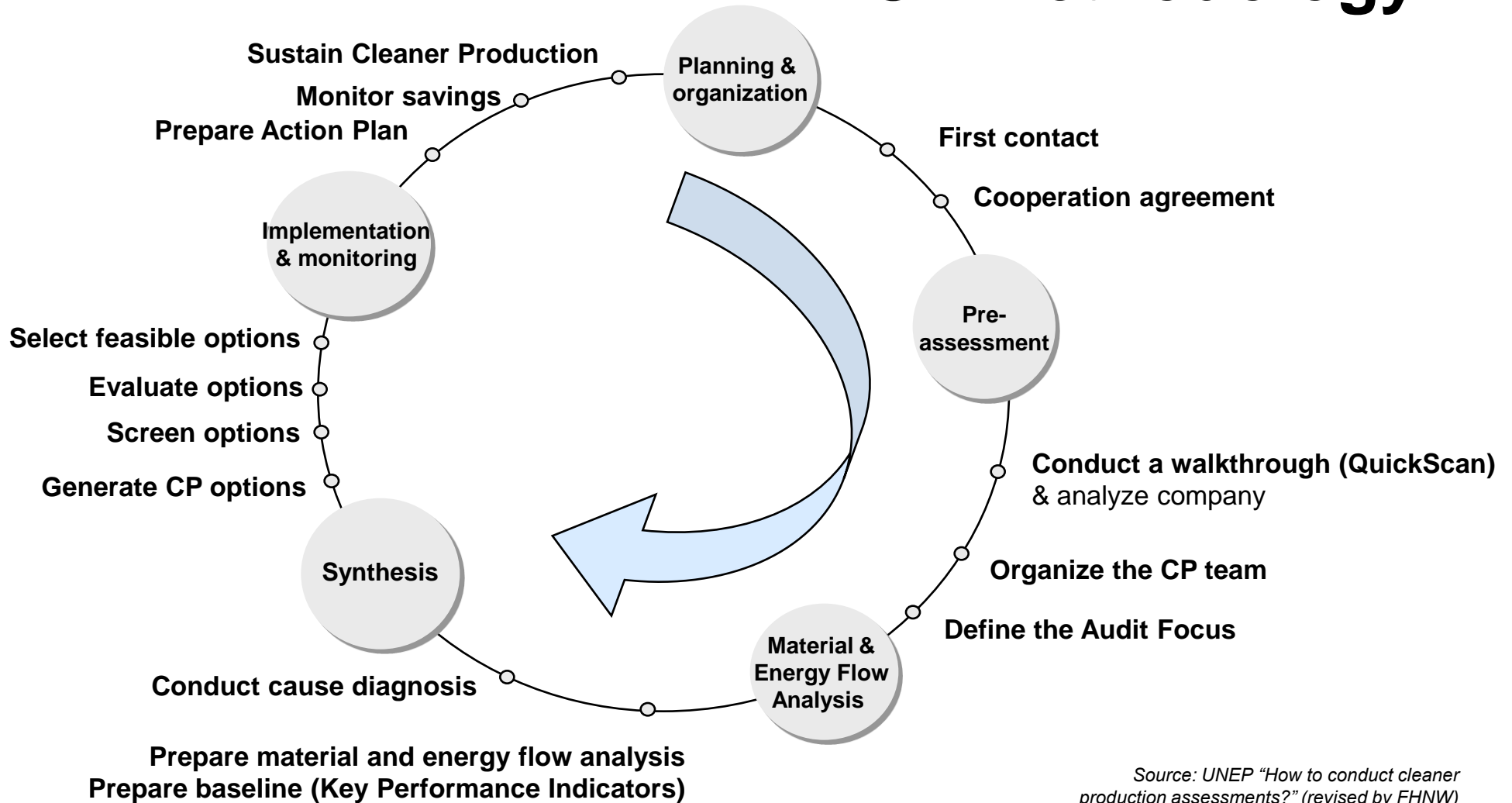
BASF plc, Public Affairs  
e-mail: [info.service@basf-plc.co.uk](mailto:info.service@basf-plc.co.uk)  
Fax: 0161 488 4133  
[www.basf.de](http://www.basf.de)

Thinking innovatively. Acting responsibly.

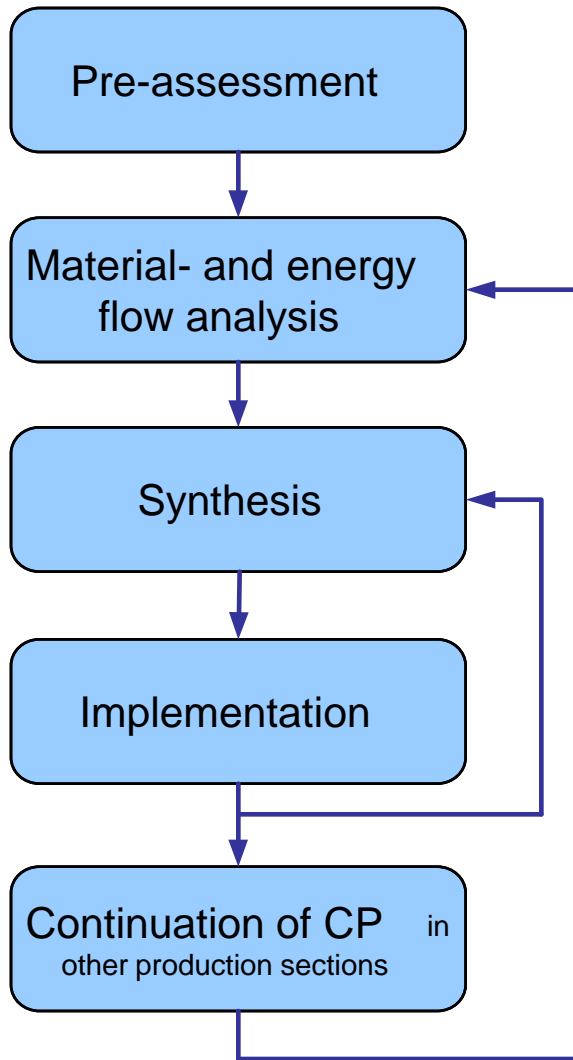
Chemicals, Plastics & Fibers  
Performance Products, Agricultural Products & Nutrition, Oil & Gas

**BASF**

# CP Methodology



Source: UNEP "How to conduct cleaner production assessments?" (revised by FHNW)



# CP Methodology

Step 1: Pre-assessment

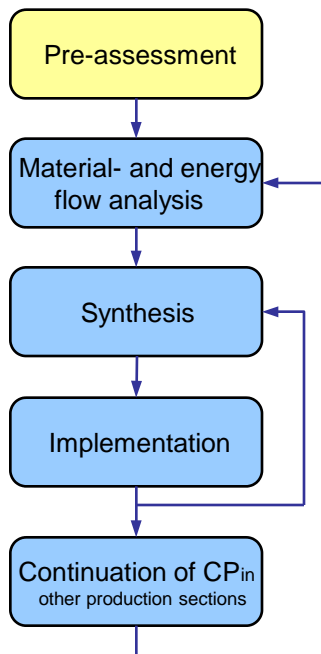
Step 2: Material and energy flow analysis

Step 3: Synthesis

Step 4: Implementation

Step 5: Sustain CP

# Step 1 - Pre-assessment

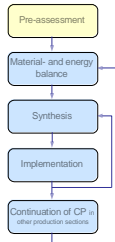


- Designate CP team
- Collect data  
Company visit and walk-through
- Describe company and production processes; evaluate process sections
- Define audit focus

**Quick-Scan**

## Step 1 - Pre-assessment

# The CP team



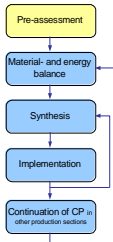
**CP team should consist of representatives from:**

- Management level
- Production departments
- Accounting and storage department
- Technical department
- CP consultant



## Step 1 - Pre-assessment – The CP team

# Who shall be CP-team member?

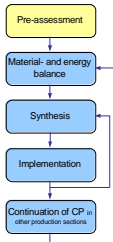


**Having the right mix in the team is crucial!**

- Attitudes
- Information
- Technical
- Financial
- Trust



## Step 1 - Pre-assessment – The CP team



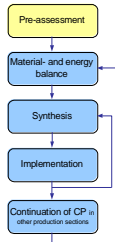
# Reasons for building a CP-team

- **Because** there are committed employees, who want to improve the situation of the company
- **Because** as a team – with common goals – you can reach far more than as a single fighter
- **Because** a team makes better decisions
- **Because** the different members have different knowledge



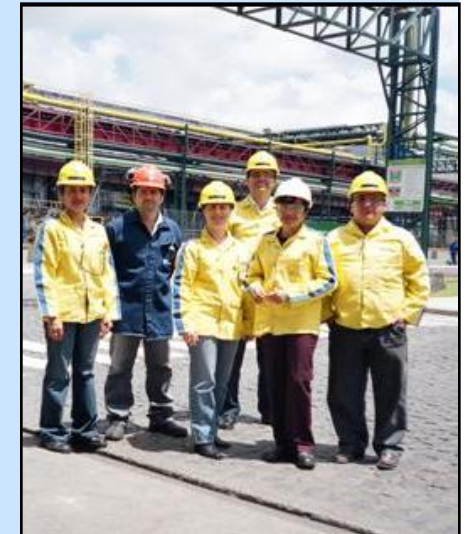
## Step 1 - Pre-assessment – The CP team

# Tasks of CP-team during the CP IPA



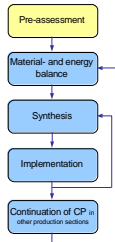
## The CP team is jointly responsible to:

- collect and compile information (process flows, material consumption and cost, etc.)
- inform internally about on-going project
- collect information about environmental issues, alternative technologies/techniques, CP options
- calculate the feasibility of options
- establish and control the action plan for implementation of options
- write the IPA report and fact sheet



## Step 1 - Pre-assessment – The CP team

# Role of external CP-consultant

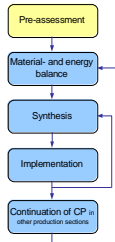


- Facilitator (moderator, motivator), project coordinator, responsible for methodological inputs
- Input of technical knowledge, CP information and contacts to sources of information
- Input of environmental knowledge, laws & regulations, safety and health issues
- Scrutinize, questioning and challenging existing service and production patterns (how? why? ...)



## Step 1 - Pre-assessment – The CP team

# Attitudes of CP-team members

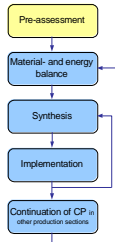


## be a team player

- be open minded towards new ideas
  - be proud to work in an innovative project
  - motivate others to participate
  - involve all team members in the works, listen to *everyone's* opinions and reasons, before you decide as team
  - distribute (as team) the workload among team-members
  - take responsibilities for tasks and deadlines
- ... **CP requires joint efforts to reach the goal of a more sustainable enterprise...**



## Step 1 - Pre-assessment – QuickScan

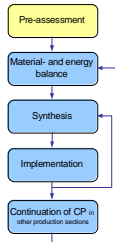


# What is a «QuickScan»?

- First assessment of the way of production of a company
- Short analysis
- Indicator for CP-potential



## Step 1 - Pre-assessment – QuickScan



# Procedure *(for CP consultants)*

## 1. Preparation

CP-Literature, sector specific



## 2. Conducting the QuickScan

Interview with management and tour through the company



## 3. Data evaluation

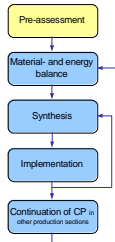
estimation of CP-potentials



## 4. Reporting



## Step 1 - Pre-assessment – QuickScan



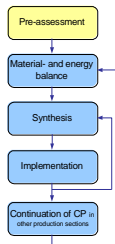
# Conducting the Quick Scans

## Interview with management *(Checklists 1 to 9)*

- General information about enterprise and environmental policy
- Estimation of potential for improvements by the company
- Energy management
- Occupational health protection
- Industrial safety and accident prevention
- Production- und consumption figures

## Step 1 - Pre-assessment – QuickScan

# Tour through the company *(Checklists 9 to 14)*



Data collection of internal processes:

### → **Production and Service facilities**

- Guest-rooms, housekeeping
- Kitchen and restaurant, bars
- Public spaces (lobby, stairs, seminar rooms, parking)
- Wellness, sport, leisure facilities
- Laundry, etc.

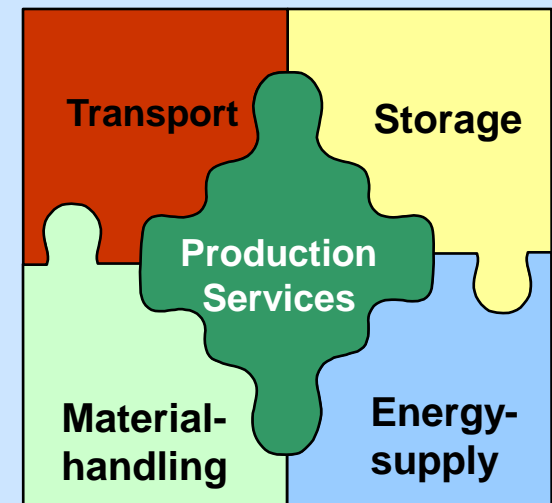
### → **Water and energy supply**

- fresh water supply, waste water disposal
- hot water preparation, heating system,
- air conditioning

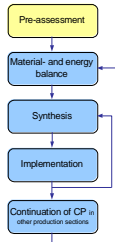
### → **Utilities** (e.g. storage, waste, waste water)

### → **Transport**

### → **Material handling**



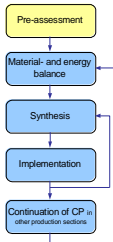
## Step 1 - Pre-assessment



## Audit focus

- **Scope:**  
Include the entire company or limit it to certain units / departments?
- **Emphasis:**  
in terms of materials, e.g. water, energy or chemicals?

## Step 1 - Pre-assessment



# Audit focus – Emphasis in Hotels

## Scope, e.g.

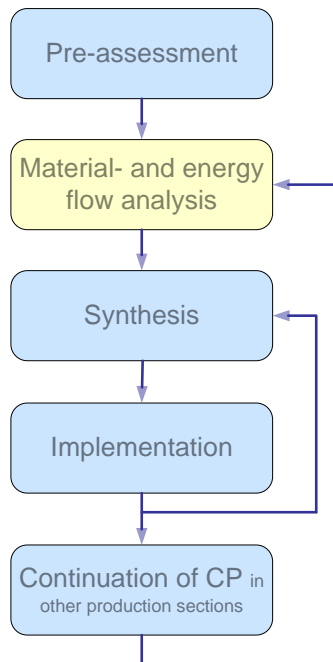
- Food & Beverage
- Housekeeping
- Leisure, wellness, garden
- Laundry

## Materials - Energy

- Water - Waste water
- Solid wastes
- Energy consumption
- Green purchase
- Transportation



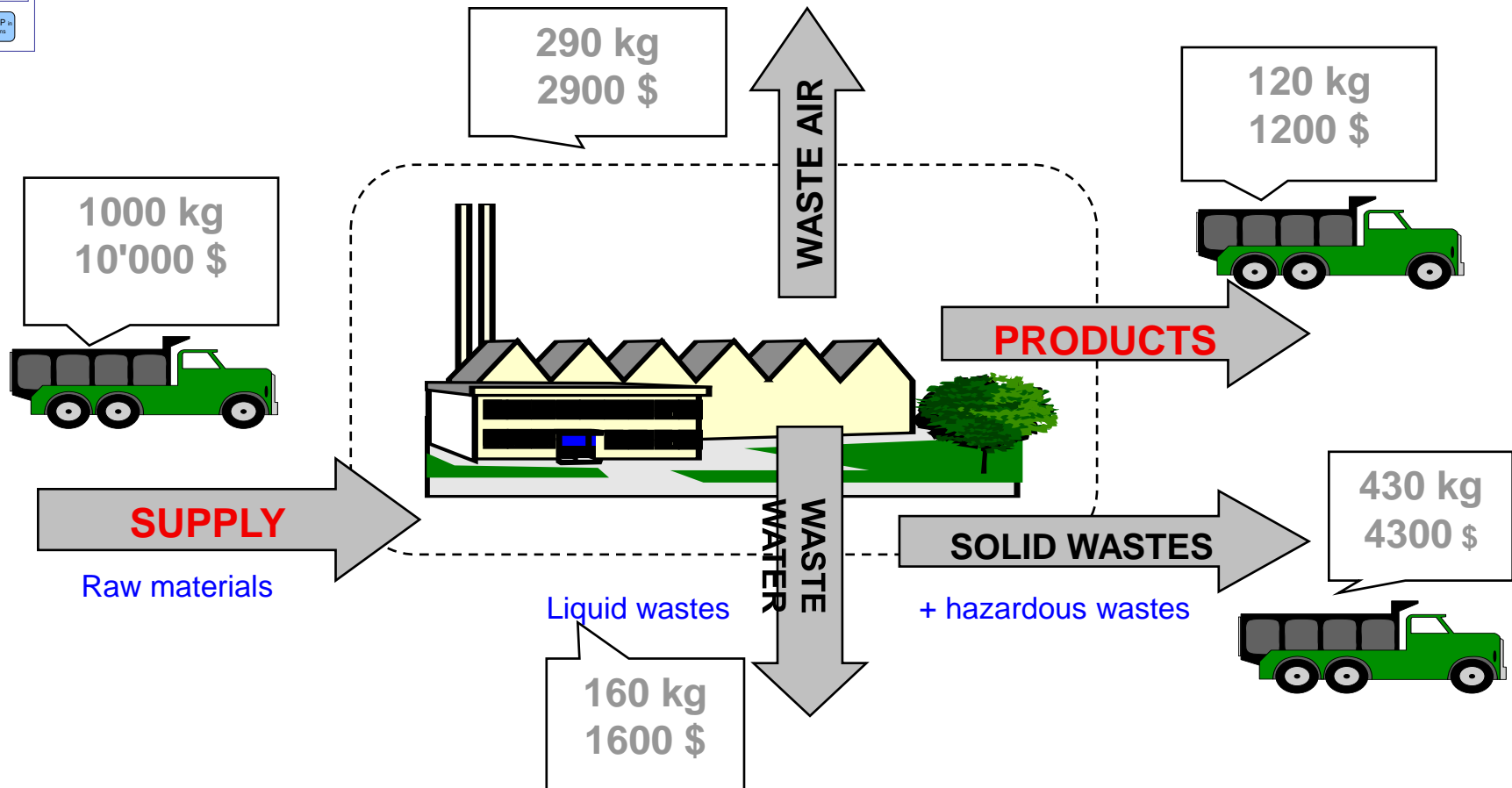
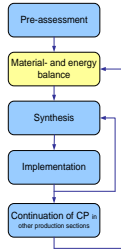
## Step 2 - Material- and energy flow analysis



- Establish process flow charts
- Collect production/service and material consumption figures
- Calculate Key Performance Indicators and compare to Benchmarks
- Conduct a cause analysis

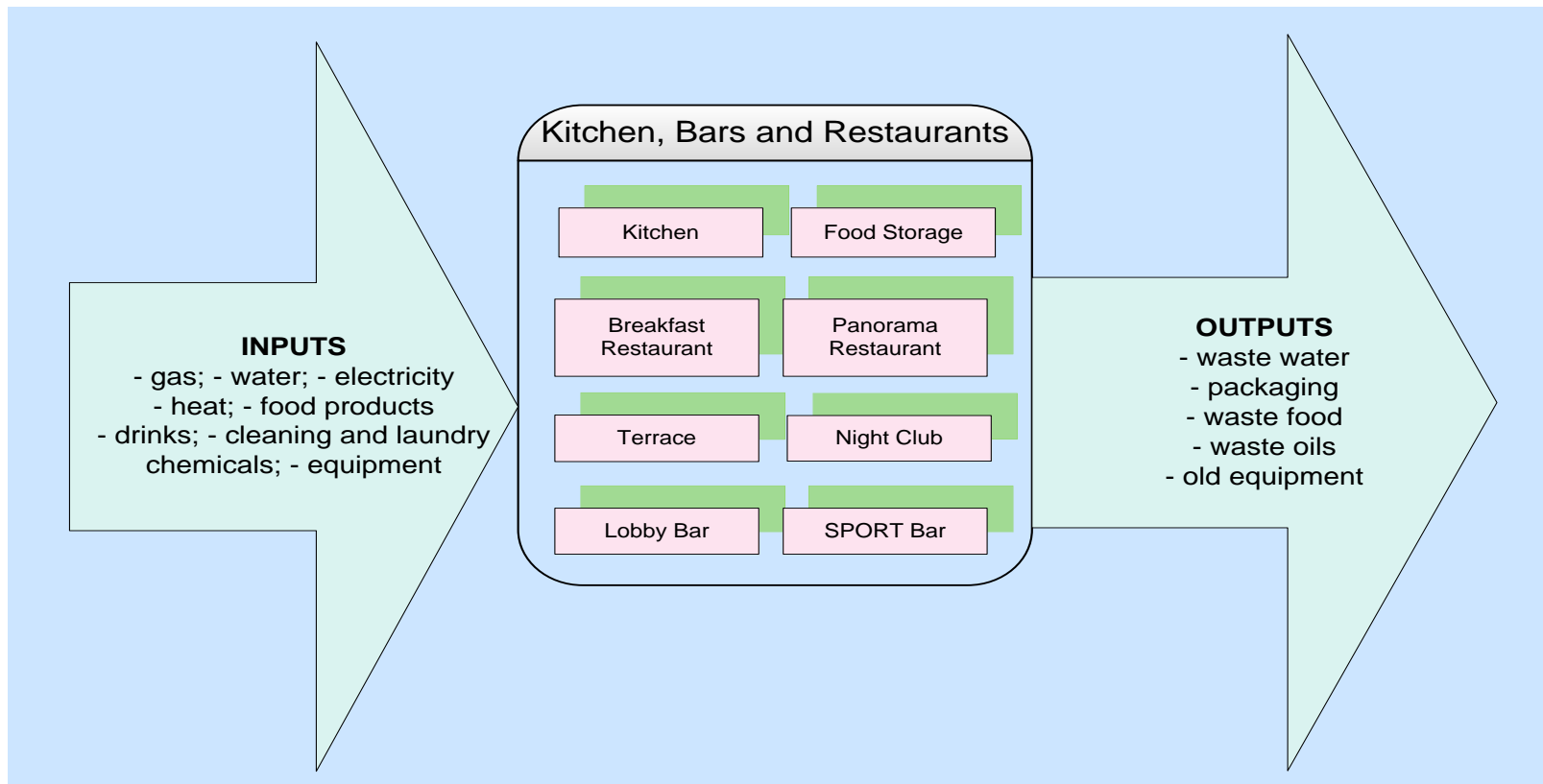
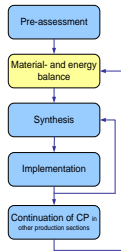
Step 2

# Material- and energy flow analysis



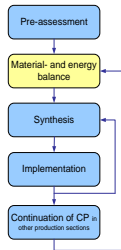
Step 2 – Material flow analysis

# Process flow chart

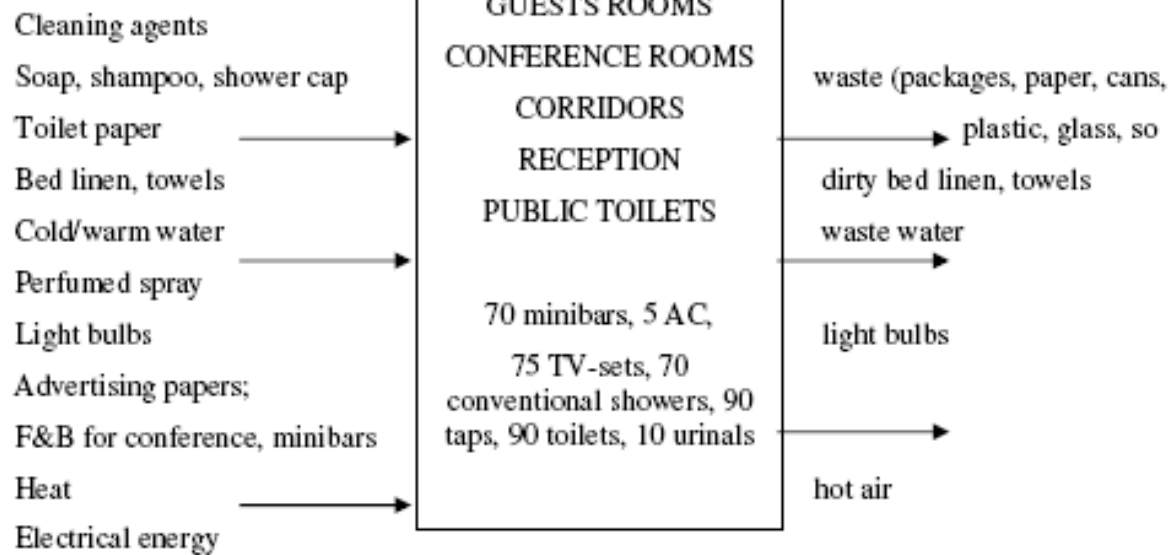


## Step 2 – Material flow analysis

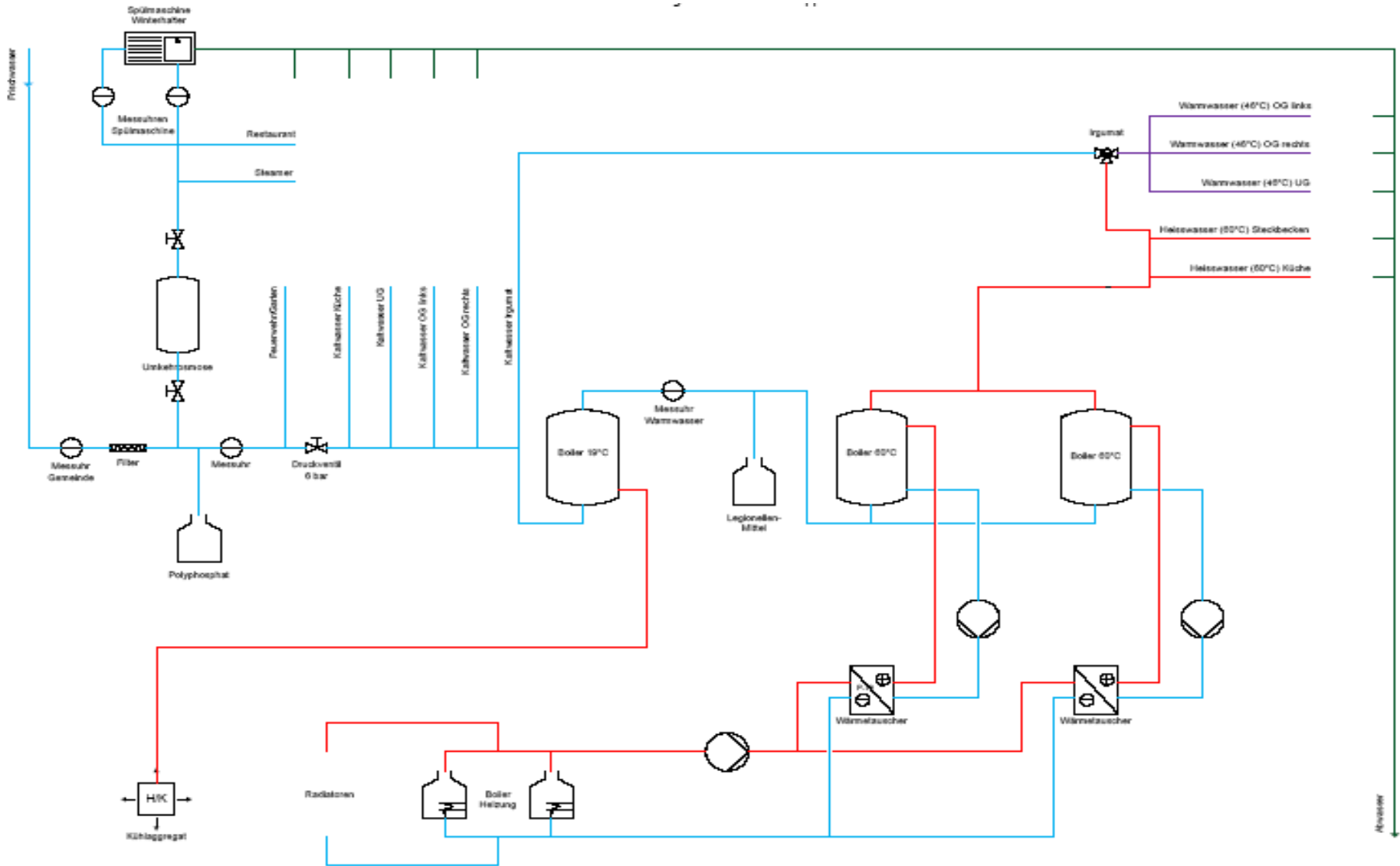
# Process flow chart



### ROOMS and PUBLIC SPACES

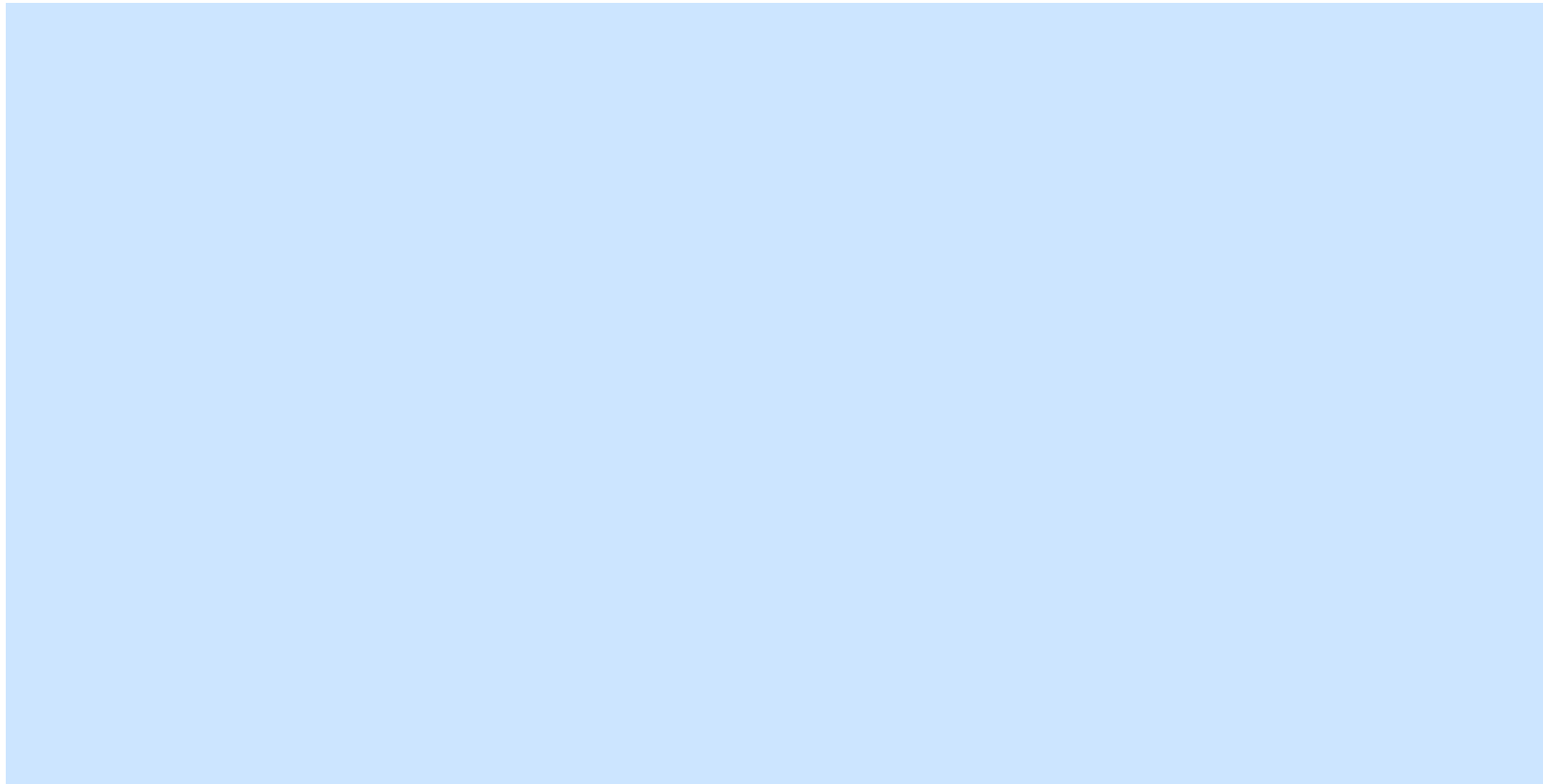
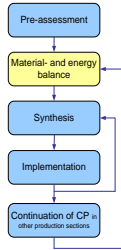


## Step 2 – Material flow analysis – Water flow analysis - Example

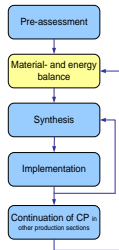


Step 2 – Material flow analysis

# Water flow charts – template in Excel



## Step 2 – Material flow analysis



# Key Performance Indicators (KPI)

## Calculation of environmental KPI for Hotels

### *Per overnight stay:*

- .... liter fresh water
- ..... kWh electricity
- ..... liter fuel oil or m<sup>3</sup> of gas (calculated as kWh)
- ..... kg waste (for municipal treatment or special wastes)

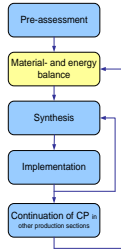
### *Per service space:*

- ..... kWh/m<sup>2</sup> (annual energy consumption)

**Compare the KPI with international standards**  
**→ Benchmarking**

## Step 2 – Material flow analysis

# Examples of KPIs

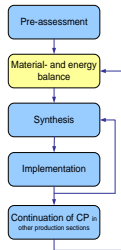


## Bed & Breakfast in Brazil

Product	Unit	KPI May-Dec. 2006	KPI 1 <sup>st</sup> Trim. 2007	KPI May 2007	Bench- mark figures	Remarks
Water	l / over-night stay	115,8	126,5	131,2	133	European Benchmark figures, Eckardt, S. 2007
El. Energy	kWh / over-night stay	6,76	9,08	10,87	15,8	
Gas	kg / over-night stay	0,18	0,15	0,10	-	

## Step 2 – Material flow analysis

# Example of KPIs

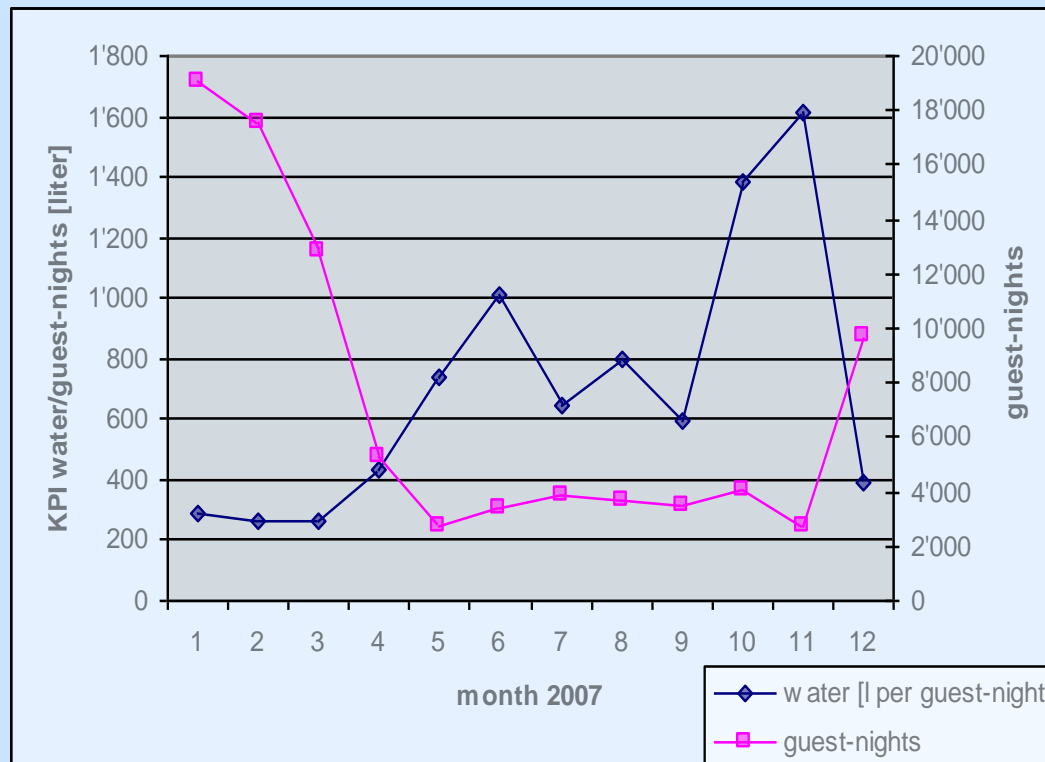
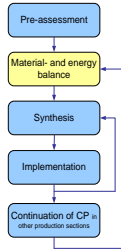


Product	Unit	KPI 2007	Bench-mark figures	Remarks
Water	l / over-night stay	480	210	European Benchmark figures, Eckardt
	l/ weighted guest-nights*	345	150	
Total Energy	kWh / over-night stay	130	78	
	kWh / weighted guest-nights*	92	22	

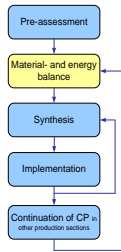
\* weighted guest-nights consider the restaurant services:  
number of overnight stay + 0.25 \* number of warm meals

Step 2 – Material flow analysis

# Example of KPIs



## Step 2 – Material flow analysis



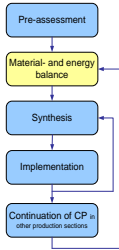
# Key Performance Indicators (KPI)

## Information to be collected during IPA

- Overnight stays (guests and staff)
- Warm meals served (guests and staff)
- Service space (heated area)
- Fresh water consumed
- Electricity consumed
- Fuel oil, gas or other fuel consumed (calculated as kWh)
- Solid waste produced (in liters, kg or containers)
- Cleaning products consumed (textile and dish cleaning)

→ *monthly figures over the period of last 1.5 years*

## Step 2 – Material flow analysis



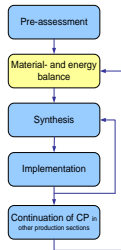
# Check degree of compliance with EU Eco-Label (optional)

### MANDATORY REQUIREMENTS

1	electricity from renewable sources	Yellow	20	waste water plan	Green
2	coal and heavy fuels < 0.2%	Green	21	disinfectants reduced	Green
3	electricity for heating from renewables (>22%)	Yellow	22	staff training on detergent use	Green
4	boiler efficiency at least 90%	Green	23	waste separation by guests	Red
5	air conditioning at least class B	Yellow	24	hazardous waste	Green
6	windows insulation	Green	25	waste separation	Green
7	switching off air conditioning and heating	Green	26	waste transportation	Green
8	switching off lights	Green	27	disposable products	Green
9	energy efficient light bulbs > 60%	Green	28	no smoking section	Green
10	Sauna timer control	Green	29	public transportation	Red
11	willingness to switch to another water source	Yellow	30	appliance maintenance and service frequency	Green
12	water flow from taps and showers	Red	31	yearly maintenance of boilers, efficiency testing	Green
13	water saving in toilets and bathrooms	Red	32	environmental policy and action programme	Red
14	waste bins in toilets	Green	33	staff training (procedures, manuals)	Red
15	urinal flushing	Green	34	information to guests	Red
16	check for leaks and repair duly	Green	35	energy and water consumption data	Green
17	changing towels and sheets	Red	36	other data collection	Red
18	watering plants and gardens	Green	37	information on the eco-label	Red
19	waste water treatment	Green			

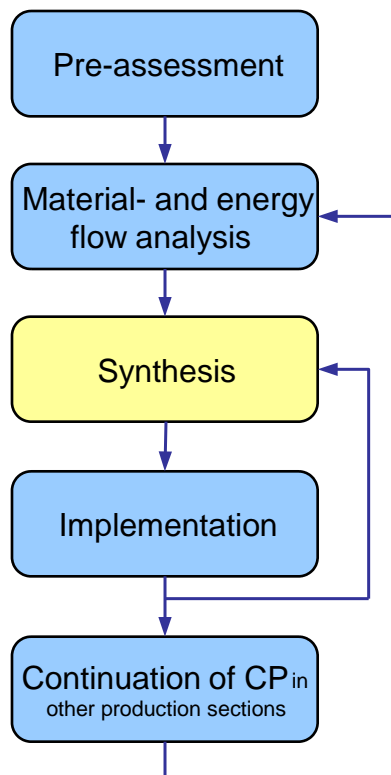
## Step 2 – Material flow analysis

# Cause analysis - example



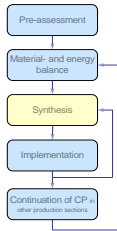
	Problem	Causes	Cleaner Production Options
High water consumption		excessive water flows in toilets	Low-flush or dual flush toilets
		excessive water flows in bathroom taps and showers	Install water-saving devices (flow regulators, water flow sensors, self-closing taps)
			Decrease tap flow by decreasing pump pressure
			Distribute brochures and flyers, or post stickers and posters, inviting guests to save water
		water leaks due to bad maintenance	Regularly maintain plumbing fixtures and wiping
			Replace defective seals and repair damage to water pipes
			Train the staff to check regularly the leakages
	Monitor water consumption		

## Step 3 - Synthesis



- Identification of CP options  
Brainstorming
- Screening of identified options
  - directly implementable
  - need further analysis
  - rejected options
- Analysis of the workable options
  - financial viability
  - environmental aspects
- Select solutions for implementation

## Step 3 – Synthesis

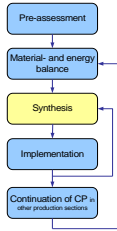


# Identification of CP options

- Obvious measures, implemented in short term (good housekeeping)
- Mid- and long-term measures

**Apply the 8 CP principles!**

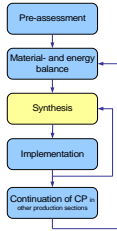
## Step 3 – Synthesis



## Identification of CP options – the 8 CP principles

1. Good housekeeping
2. Segregation (material- and/or waste streams)
3. Input material change
4. Process / production change
5. Process control
6. On site recycling or recovery
7. Production of useful by-product
8. Product modification

## Step 3 – Synthesis



# Evaluation of options

## Calculation of:

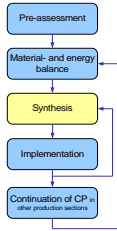
- economic feasibility
- environmental benefits
- technical viability
- organizational viability

## Rating (comparing) the feasibilities

→ Option list with priorities

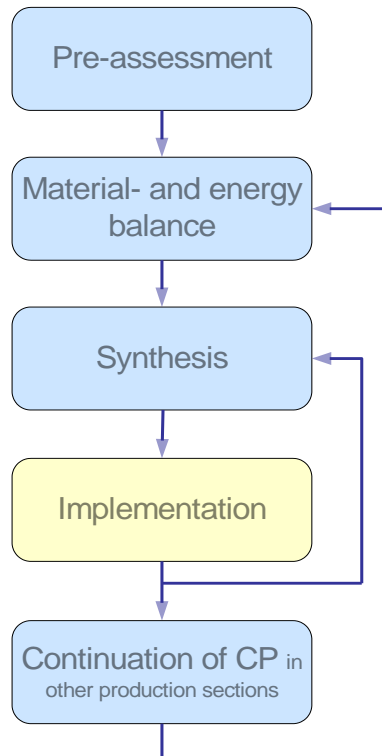
### Step 3 – Synthesis

# Evaluation of options (example)



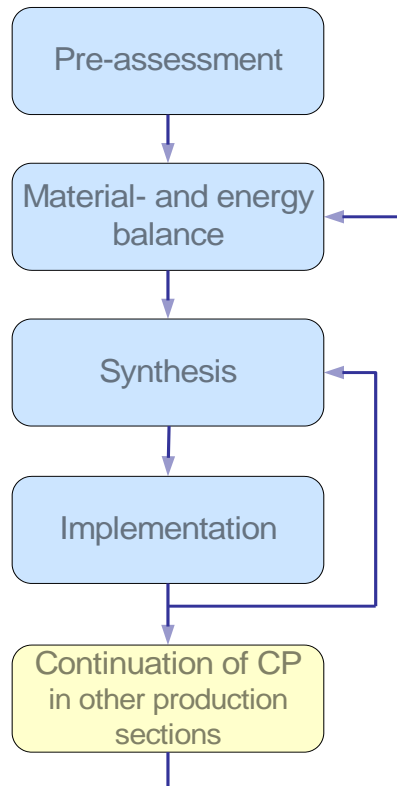
Option	Economic feasibility	Environmental feasibility	Technical Viability	Organizational Viability	Total	Priority*
Install low-flush or dual flush toilets	☒☒☒	☒☒☒☒	☒☒	☒☒	11	2
Install water-saving devices (flow regulators, water flow sensors, self-closing taps)	☒☒☒	☒☒☒	☒☒	☒☒	10	2
Collect rainwater for watering garden	☒☒☒	☒☒☒	☒☒☒	☒☒☒	12	2
Reduce water pollution by using less polluting detergents, use disinfectants “environmental friendly”	☒☒☒	☒☒	☒☒☒	☒☒	10	3
Install economical light bulbs	☒☒☒☒	☒☒☒☒	☒☒☒☒	☒☒☒☒	16	1

## Step 4 - Implementation



- Low cost and no cost option:  
→ implementation *as soon as possible*
- The high priority options  
→ implementation according *action plan*  
→ action plan needs to be approved by management
- Monitoring of the results

## Step 5 – Sustain CP



### Maintaining CP

- To be one part of the daily management
- To monitor regularly on company- and process level
- To report to management and employees

→ *Select new audit focus for next In-plant Assessment*

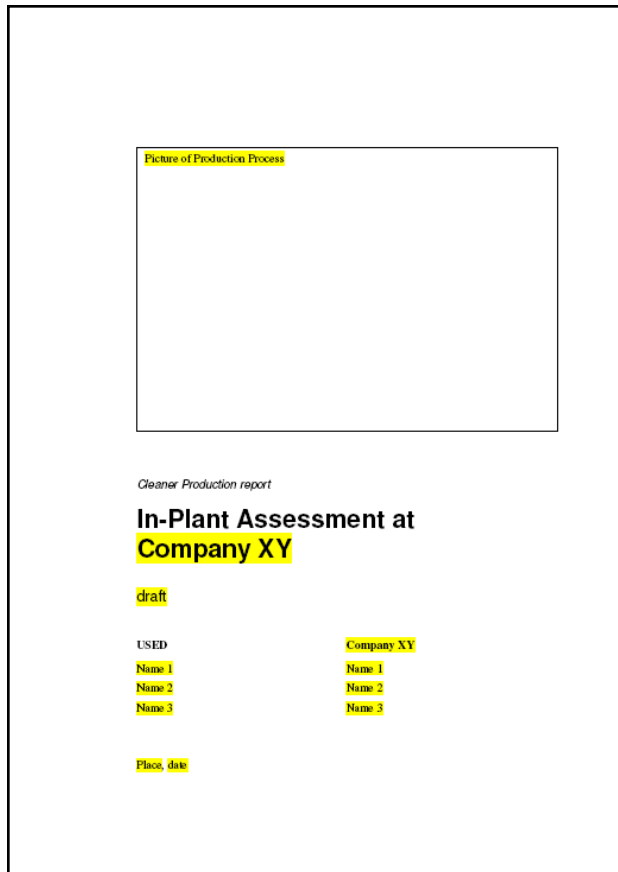
# Success factors for the implementation of CP in a company

- The management commitment
- The involvement of employees
- Cost awareness and proper cost information
- A well established project management

(Van Berkel 1999)

# Conclusions

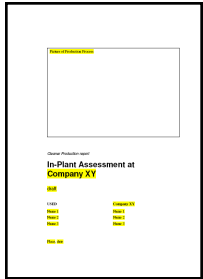
- A CP In-Plant Assessment creates transparency in the company
- Management and staff are sensitized for process efficiency and environmental matter
- CP solutions need in-depth analysis of the processes
- CP is not a single project
  - ***CP is a strategy for continuous improvement***



## IPA report template

- Guides through the IPA
- Structures the IPA reports
- Fully formatted

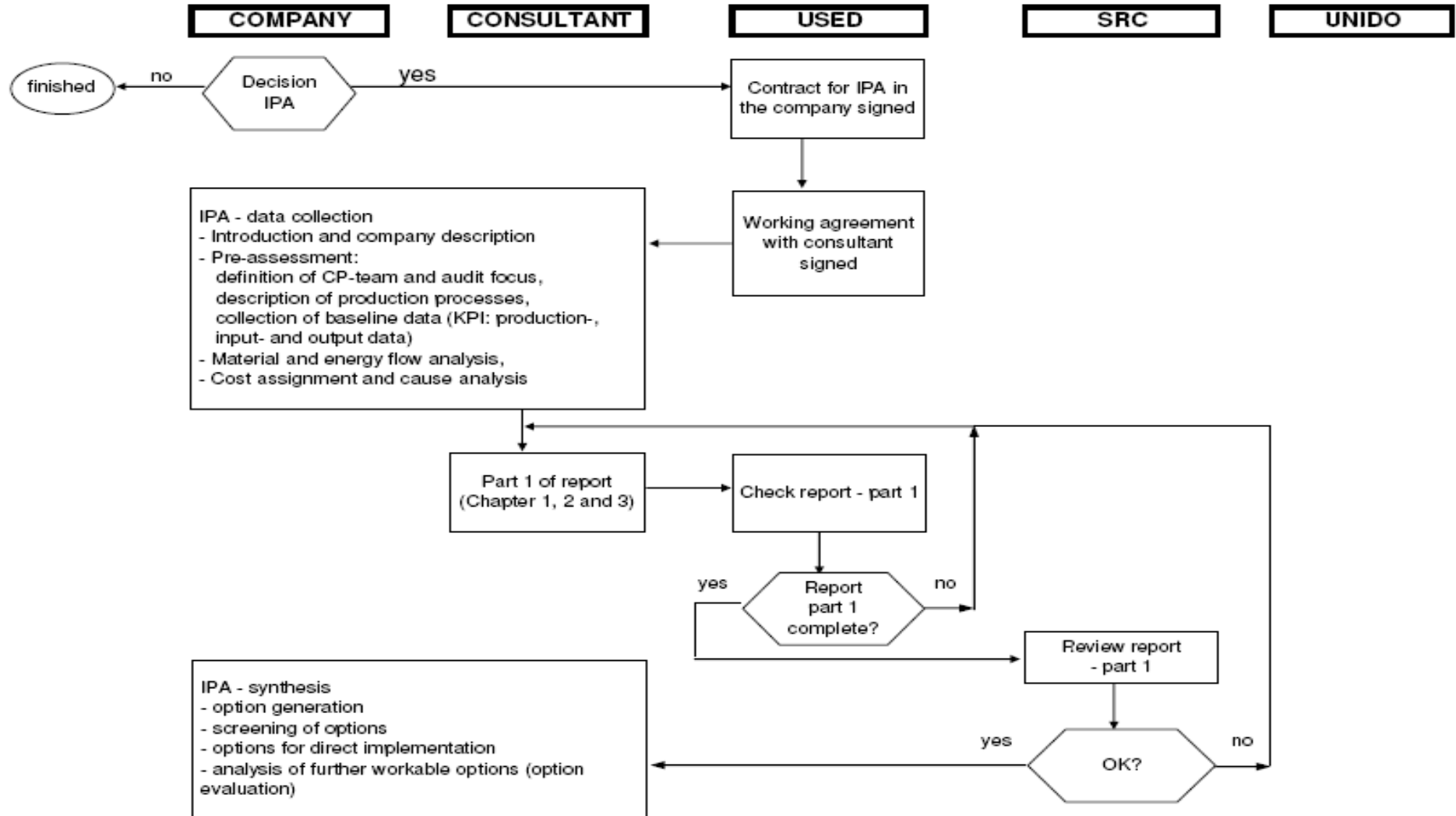
***Goal: to standardize reports from different consultants to obtain constant quality and corporate identity***



## Changes in new IPA report template

- **no EcoInspector to be filled out**  
→ *definition of audit focus after discussion in the team (after QuickScan), preferable for whole hotel*
- **no cost assignment for waste streams**  
→ *elaboration of KPI for total water and energy cost (per guest night)*
- **no detailed material / energy data for sub-process sections** → *measurements to be done in case of the evaluation of specific CP option*
- **material flow template, KPI template**

## Project flow chart for In-Plant Assessments



# Documentation

## *Background information*

- Information EU-Eco-Label
- UNEP guide for hotels
- SBA self-assessing guide for hotels
- Checklist Energy in hotels
- *Benchmark information*
- *Envirowise (UK) Guides for Hotels and Restaurants*
- *Fact Sheets / Case Studies*

## *Tools*

- IPA report template & quality control sheet
- QuickScan manual (with checklists)
- IPA project planning sheet (MS Excel)
- KPI worksheets (MS Excel)
- Material flow worksheets (MS Excel)

# Thank you for your attention!