



*Florida International University*  
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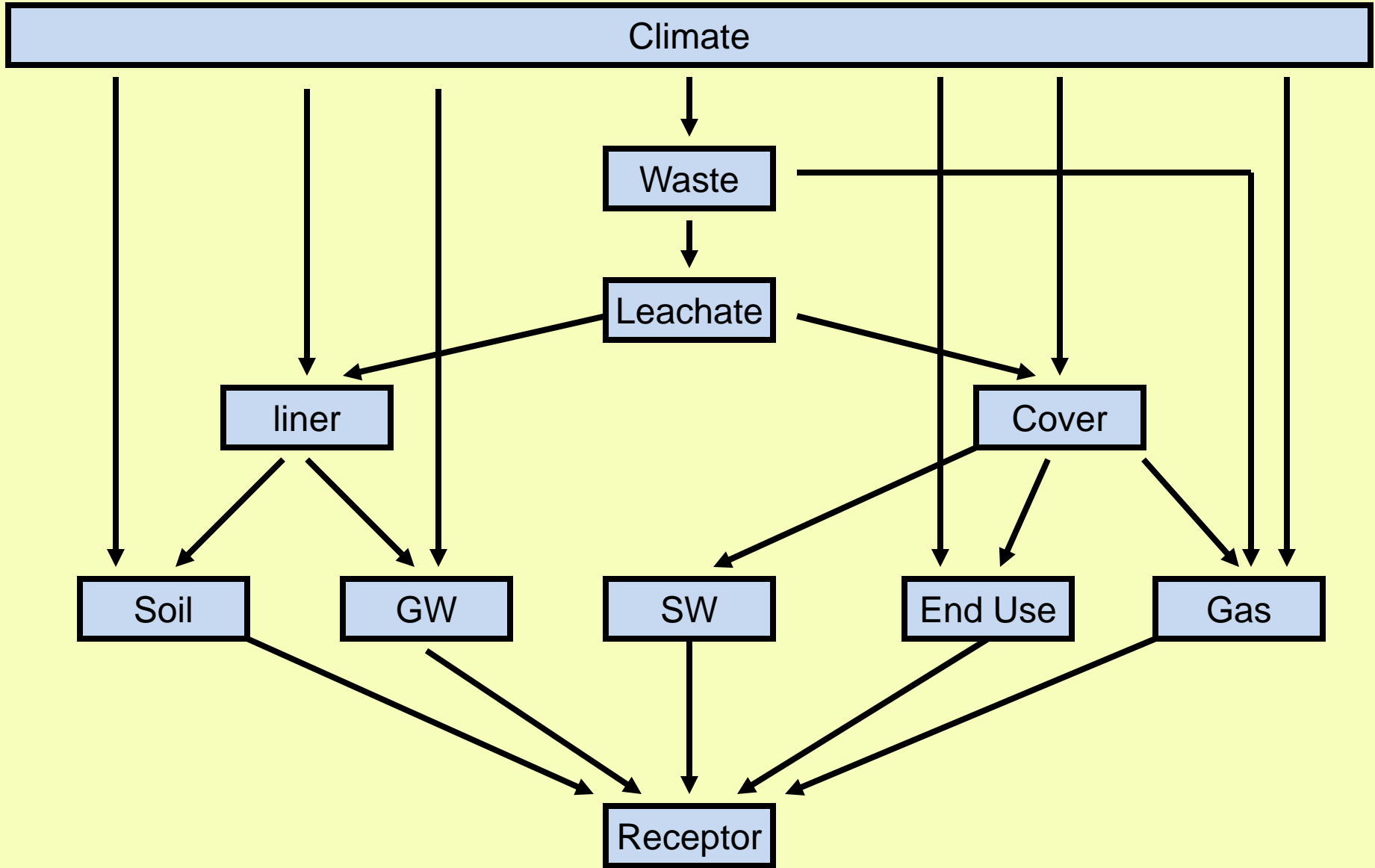
**Knowledge Based Parametric Assessment  
For Long Term Landfill Performance**

*Vivek Kumar*

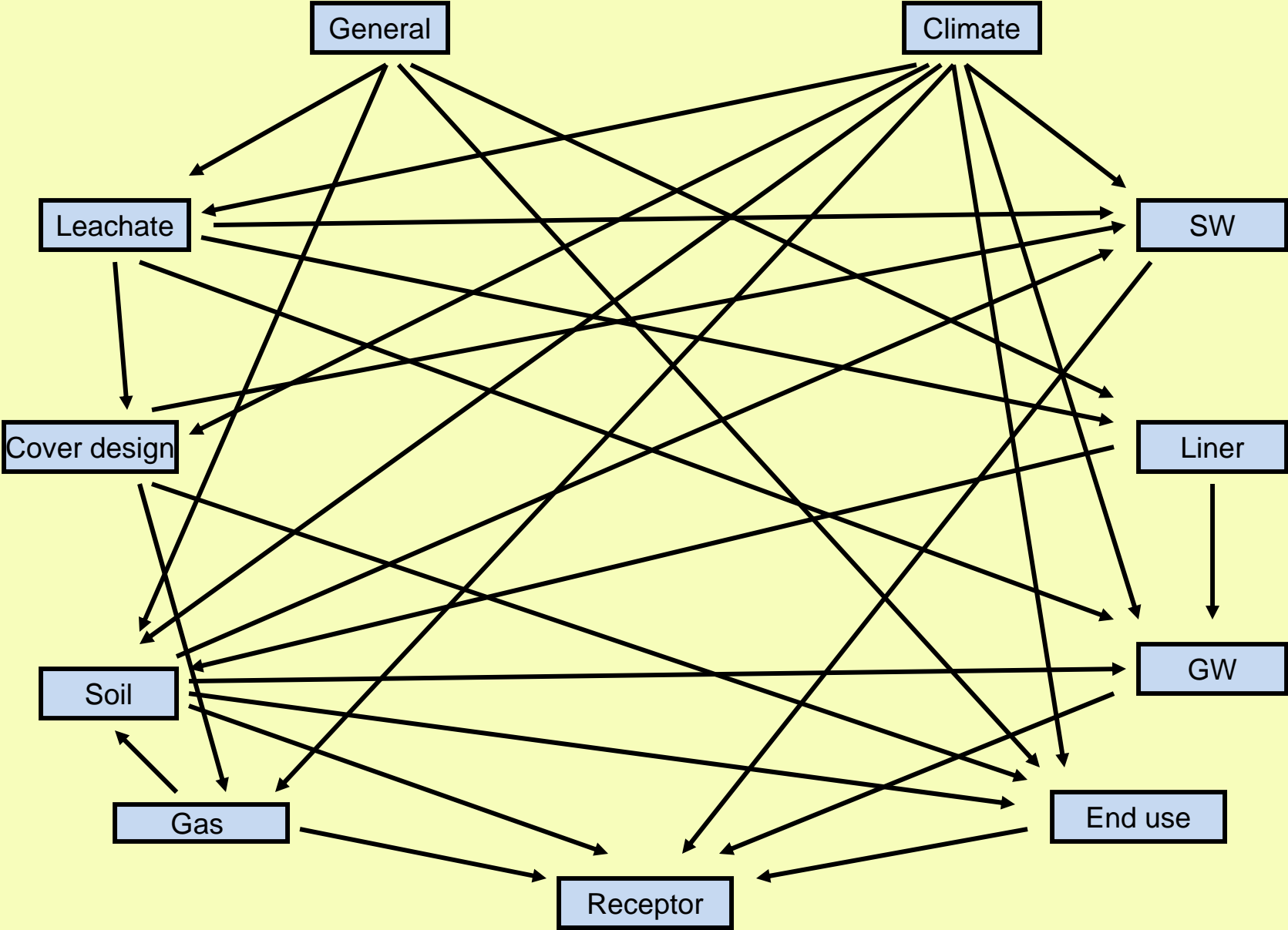
# Two different assessments

1. Use of weighted criteria to Assess the conditions and overall performance of the landfill.
2. Use of a questioner to assess the changes of conditions at the landfill.

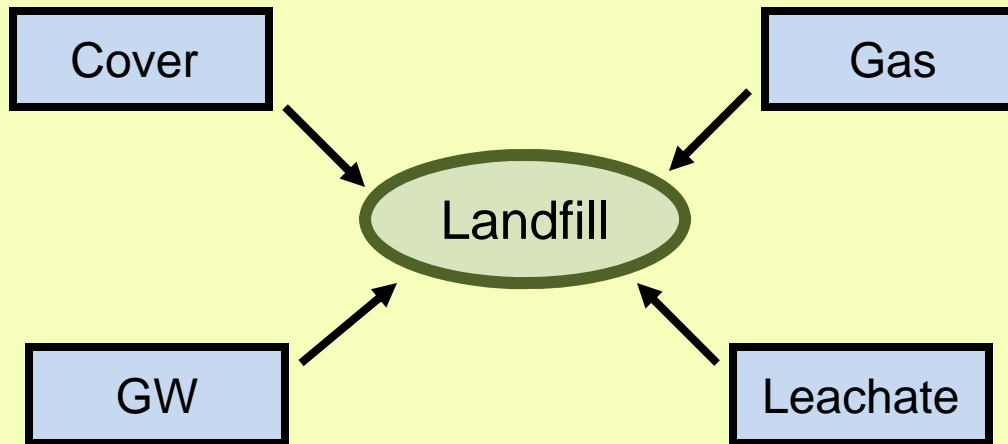
# General Knowledge Based Interactions



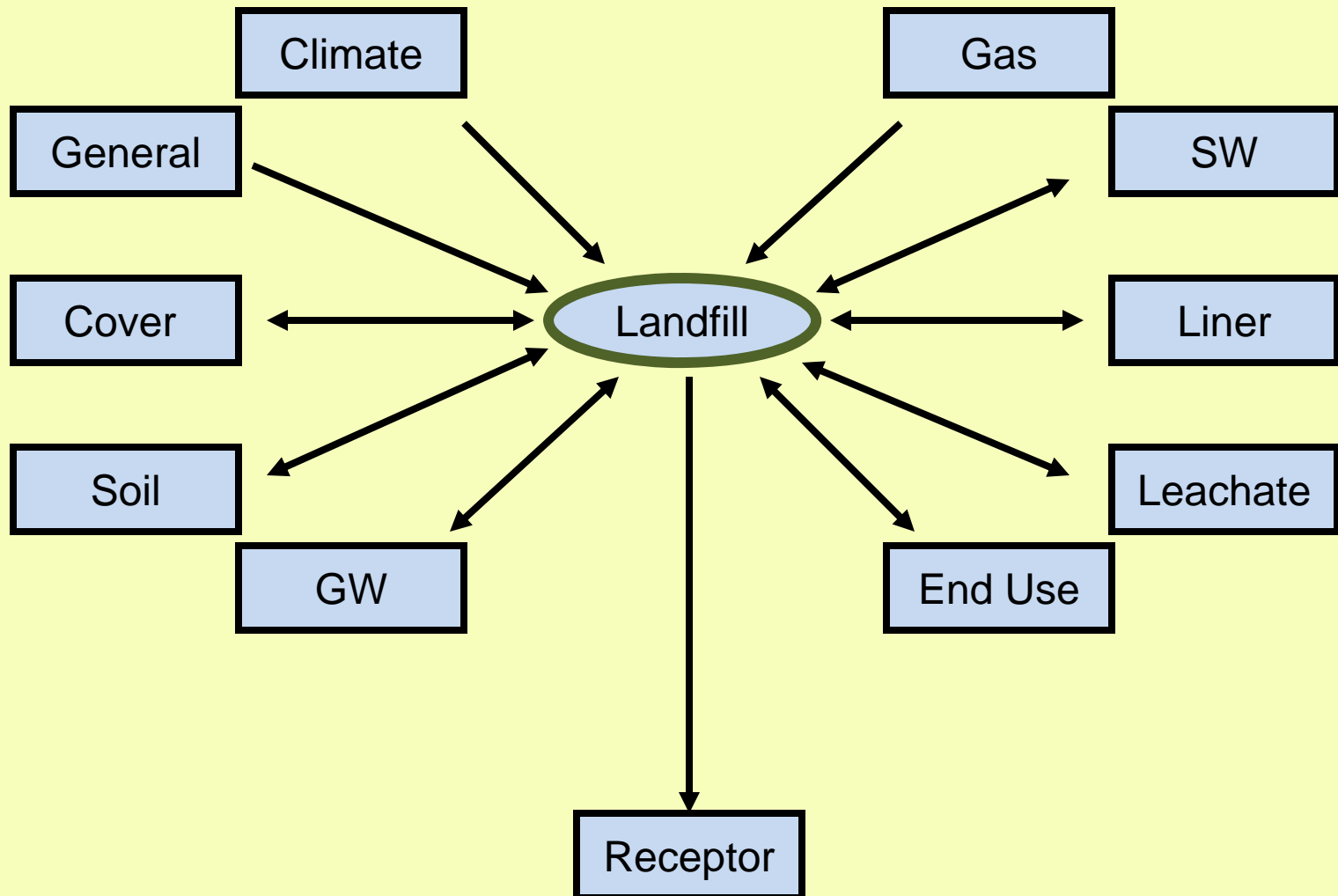
# Categories Interdependence



# Categories Affecting The Landfill (EPA approach)



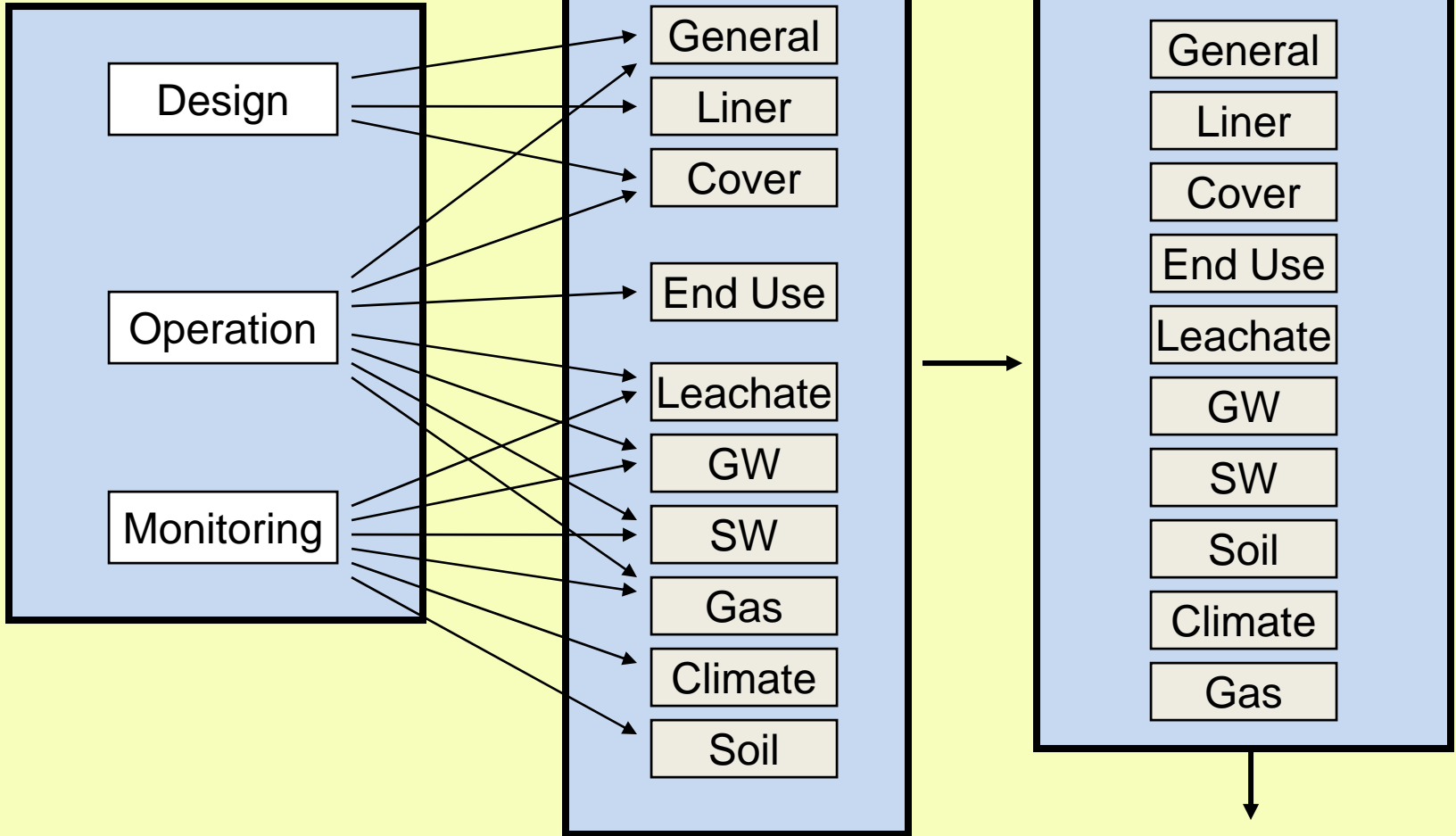
# Categories Affecting The Landfill performance



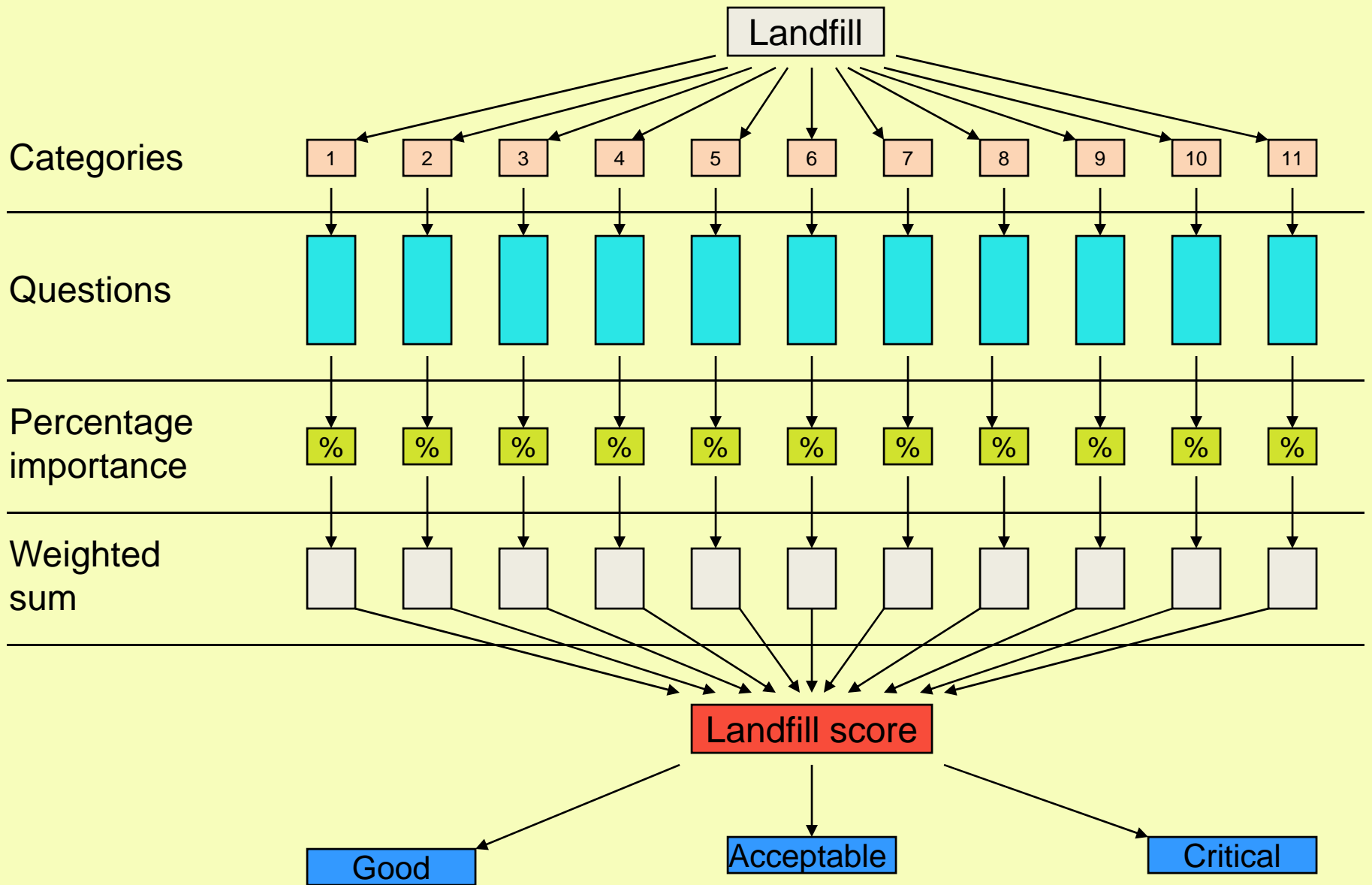
# Knowledge Base

categories

User Defined Weights



Landfill score



# Checklist categories

1. General
2. Climate
3. Liner
4. Soil
5. Leachate
6. Cover Design
7. Groundwater
8. Gas Collection
9. Surface Water
10. End Use
11. Receptors

# Categories

# Questions

## Landfill



Landfill

1 2 3 4 5 6 7 8 9 10 11

Categories

Questions

Questions

Percentage importance

% % % % % % % % % % %

Weighted sum

Weighted sum

Landfill score

Good

Acceptable

Critical

# Performance of the Landfill

Each factor is scaled ranging from 1 to 10 with some exceptions.

**1 = Best and 10 = Worst**

Example:

Categories			Maximum score	Minimum score
<b>General</b>	Age with fill material		8	1
	Fill area		10	2
	Fill volume		10	3
<b>Climate</b>	Type		8	3
	Precipitation		10	2
	Evapotranspiration		10	2
	Hurricane activity		10	1
<b>Soil</b>	Subsoil type		10	1
	Depth to aquifer		10	1
	Soil contamination		10	1
	Soil contamination type		8	1

# Performance of the landfill (Ranking)

Each factor is then divided into subparts forming the Ranking

Example:

## Soil

### Subsoil type

Sand	Loam	Silt	Clay
10	6	3	1

### Depth to aquifer

0-5 ft	5-10 ft	10-15 ft	15-20 ft
10	8	5	1

### Contamination

Yes	No
10	1

### Contamination type

Heavy Metals	Metals	Organics	Other
8	2	9	1

## Surface water

### SW management system

Yes	No
1	10

### Run off controlled

Yes	No
1	10

### Erosion controlled

Yes	No
2	6

### Sedimentation control

Yes	No
2	7

### Flooding controlled

Yes	No
2	7

Landfill

1 2 3 4 5 6 7 8 9 10 11

Categories

Questions

Questions

Percentage importance

% % % % % % % % % % %

Weighted sum

Weighted sum

Landfill score

Good

Acceptable

Critical

# User Defined Category Importance

	Categories	Percentage Importance
1	General	10
2	Climate	5
3	Soil	10
4	Liner	10
5	Leachate	10
6	GW	10
7	Cover	10
8	Gas	10
9	SW	10
10	End use	5
11	Receptors	10

# Landfill Score

$$\text{Category Weighted Sum} = \frac{\text{Sum of the Points attained}}{\text{Highest sum possible}} \times \text{Category's \% Importance}$$

$$\text{Total Weighted Sum} / \text{Landfill Score} = \sum \text{Category Weights}$$

[Excel sheet](#)

# Condition Of The LF Based On Total Weighed Sum

Landfill Condition :

1. Good :  $< 40$
2. Acceptable : 40-55
3. Critical :  $> 55$

# Assessment of Time Dependent Conditions at the Landfill

- 37 questions were developed
- Each question is assigned a weight percentage based on its significance on PCC
- Example questions:

	<b>Questions</b>	<b>Weighted %</b>
1	Age of the landfill along with the fill material?	6
2	Has there been any hurricane activity impacting the landfill?	4
3	What is the depth to aquifer?	3
4	Is the subsoil contaminated?	3
5	What are the contaminants in the subsoil?	2
6	What is the trend of the constituent in the subsoil?	2
7	Does the landfill have a liner?	3
8	What is the Liner extent?	2
9	What type of liner is in place?	3
10	What is the Type of Barrier layer?	2

# Example

