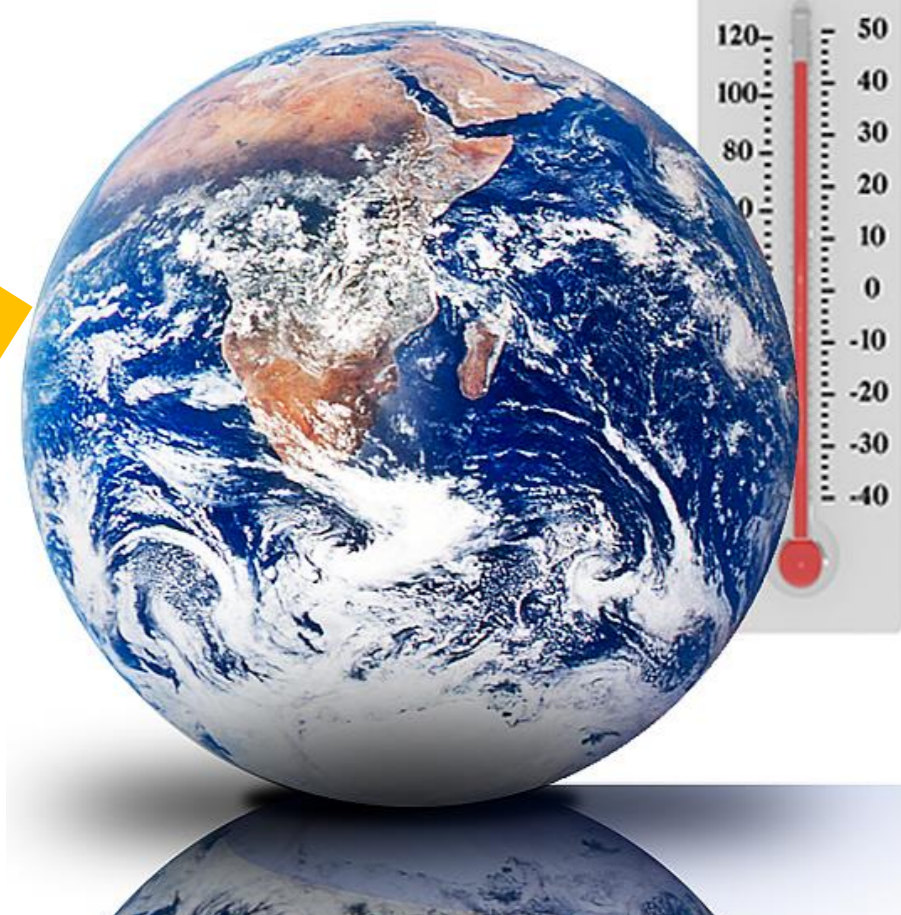


## INTRODUCTION

IPCC

UNFCCC



2° C target

How much the world can still emit to stay below IPCC's reduction targets?



### I. PRINCIPLE OF INERTIA

Based on the past emissions of the country

$$\text{Equation : } E_c^t = (E_c^b / E_w^b) \cdot E_w^t$$

$$\text{Emission (C)} = [\text{Past emissions (C)} / \text{Past emissions (W)}] \times \text{Future emissions (W)}$$

Table 1: Emissions per year (based on inertia sharing)

		2 °C		3 °C	
		66 %	50 %	66 %	50 %
from 2015	Emission /year	3831733.27	3883513.45	3858342.53	3855097.50
	% share	9.58	9.58	9.58	9.58
	emission years	30	37	72	82
from 2020	Emission /year	4354242.35	4447547.55	4459344.76	4432228.78
	% share	9.58	9.58	9.58	9.58
	emission years	22	28	58	67

- Beneficial for industrialized countries of the world.
- Under criticism for being bias to the under-developed and developing countries to prevent their economical development.

### II. PRINCIPLE OF EQUITY

Based on the population of the country (dividing world emissions equally among the number of people on Earth.

$$\text{Equation : } E_c^t = (P_c^b / P_w^b) \cdot E_w^t$$

$$\text{Emission (C)} = [\text{Population(C)} / \text{Population(W)}] \times \text{Future emissions (W)}$$

Table 2: Emissions per year (based on equity sharing)

		2 °C		3 °C	
		66 %	50 %	66 %	50 %
from 2015	Emission /year	6412351.96	6499005.36	6456882.18	6451451.66
	% share	16.03	16.03	16.03	16.03
	emission years	30	37	72	82
from 2020	Emission /year	7286763.59	7442908.52	7462650.98	7417272.78
	% share	16.03	16.03	16.03	16.03
	emission years	22	28	58	67

- Beneficial for countries with high population.
- India (having second highest world population) is believed to have benefitted the most with this principle.

### III. PRINCIPLE OF INCLUSION

Based on the population of the country along with the compensation it owes to the world (credit/debit)

$$\text{Equation : } E_c^t = [(P_c^b / P_w^b) \cdot E_w^t] - C_c^n$$

$$\text{Emission (C)} = [\text{Population(C)} / \text{Population(W)}] \times \text{Future emissions (W)} - \text{Compensation (C)}$$

$$\text{Compensation (for N years)} = (1/N) \times \text{Historical emission debt (or credit) of the country}$$

$$\text{HED} = \sum \{ \text{Emission (C)}_j - [(\text{Population(C)} / \text{Population(W)}) \times \text{emissions (W)}_j] \}$$

Table 3: Emissions per year (based on inclusion sharing)

		2 °C		3 °C	
		66 %	50 %	66 %	50 %
from 2015	Emission /year	8554885.98	8236195.11	7349604.69	7235305.57
	% share	21.39	20.32	18.25	17.98
	emission years	30	37	72	82
from 2020	Emission /year	10208400.89	9738480.69	8570858.24	8376616.38
	% share	22.46	20.98	18.41	18.10
	emission years	22	28	58	67

- Taking its dynamic nature, it is the most unbiased principle

- The fifth Assessment report of IPCC has observed a close relation between global temperature and carbon emissions. This implies that greenhouse gas emissions need to be controlled in order to control the rise in global temperature by setting a limit on amount of GHG the world can still emit. There is a need of translating this limit into corresponding carbon budgets for different sources of GHG.

- Different researches propose different theories for these reduction targets. Moreover, the future cumulative GHG available to the world also differs according to the different theories.

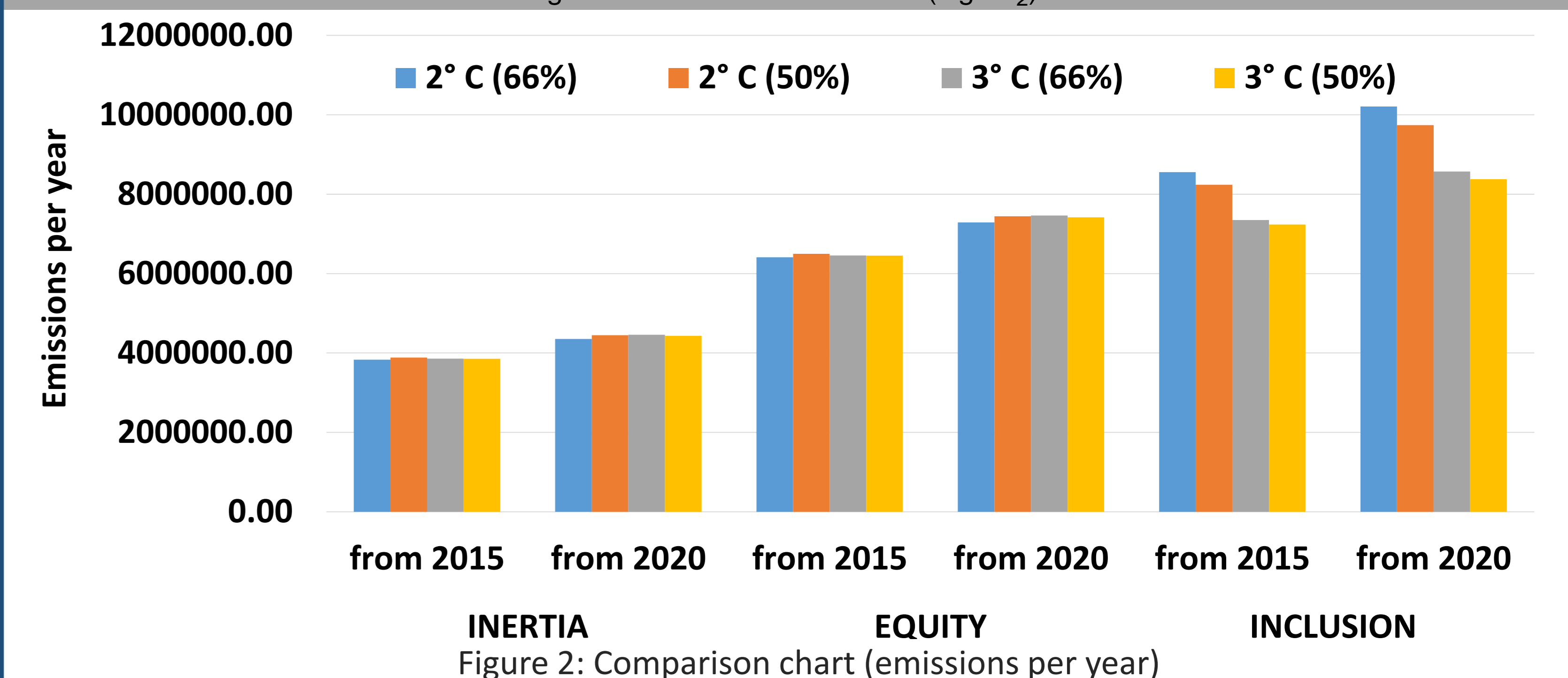
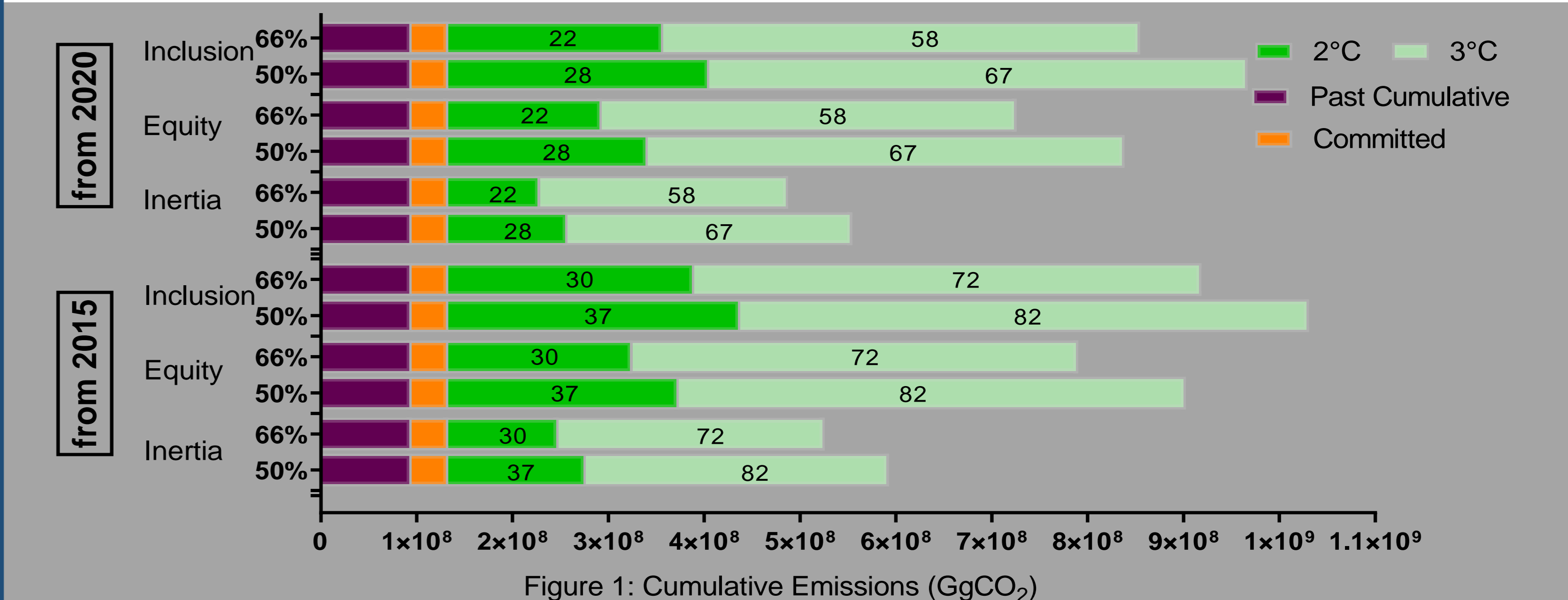
- Different researchers have suggested different GHG sharing principles and using different cumulative budget as base, various sharing numbers are presently floating around.

Q How different are the different sharing principles and how can the affect the development of a country?

## RESULTS

Table 4: Cumulative emission quota of India

	2 °C		3 °C	
	66 %	50 %	66 %	50 %
Cumulative remaining carbon budget for the world				
from 2015	12000000000	15000000000	29000000000	33000000000
emission years	30	37	72	82
from 2020	10000000000	13000000000	27000000000	31000000000
emission years	22	28	58	67
Cumulative remaining carbon budget of India based on the principle of inertia				
from 2015	114951998.139	143689997.673	277800662.168	316117994.881
emission years	30	37	72	82
from 2020	95793331.782	124531331.317	258641995.812	296959328.525
emission years	22	28	58	67
Cumulative remaining carbon budget of India based on the principle of equity				
from 2015	192370558.655	240463198.318	464895516.749	529019036.300
emission years	30	37	72	82
from 2020	160308798.879	208401438.543	432833756.973	496957276.525
emission years	22	28	58	67
Cumulative remaining carbon budget of India based on the principle of inclusion				
from 2015	256646579.399	304739219.062	529171537.493	593295057.044
emission years	30	37	72	82
from 2020	224584819.623	272677459.287	497109777.717	561233297.269
emission years	22	28	58	67



## CONCLUSION

- Inertia sharing is unjust for the countries that have low cumulative past emissions.
- Equity sharing is unjust for the developed countries, which mostly happen to have a low share of world population.
- Inclusive sharing principle is suggested to be a potential option to include the metrics of responsibility and capability for a justified sharing. Due to its flexibility, it can be modified according to the context of the country.
- Various factors like Gross Domestic Product, Negative emissions, future prediction of population distribution etc. can be included in the inclusive principle while the other principles do not have a scope of adding any of these external factors into the equation.