Developing an Afro-centric Neighbourhood Assessment Framework

to enhance the sustainability and inclusivity of communities in South African urban precincts using

Community-based Facilities Management and cyber technologies

Team

Prof Kathy Michell

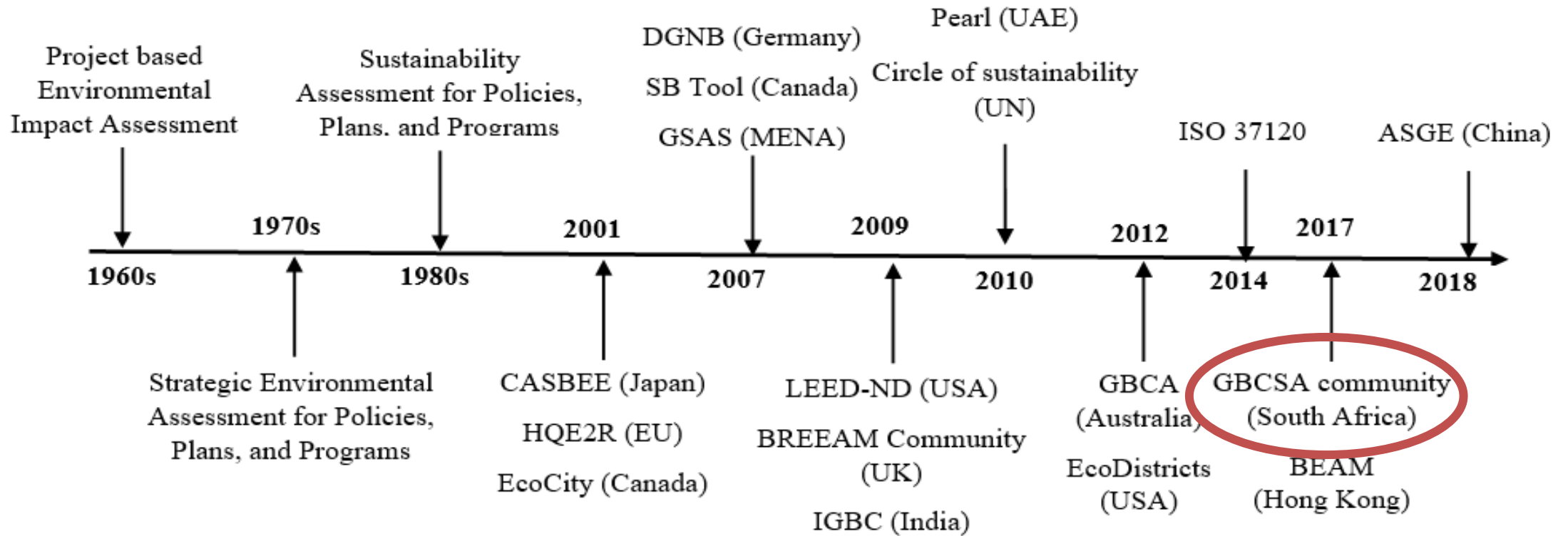**Prof Patricia Tzortzopoulos**

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Dr Alireza Moghayedi

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Introduction

- Neighbourhoods' sustainability has been receiving growing attention over the years due to its impact on the community's wellbeing and the sustainability of cities and the planet.
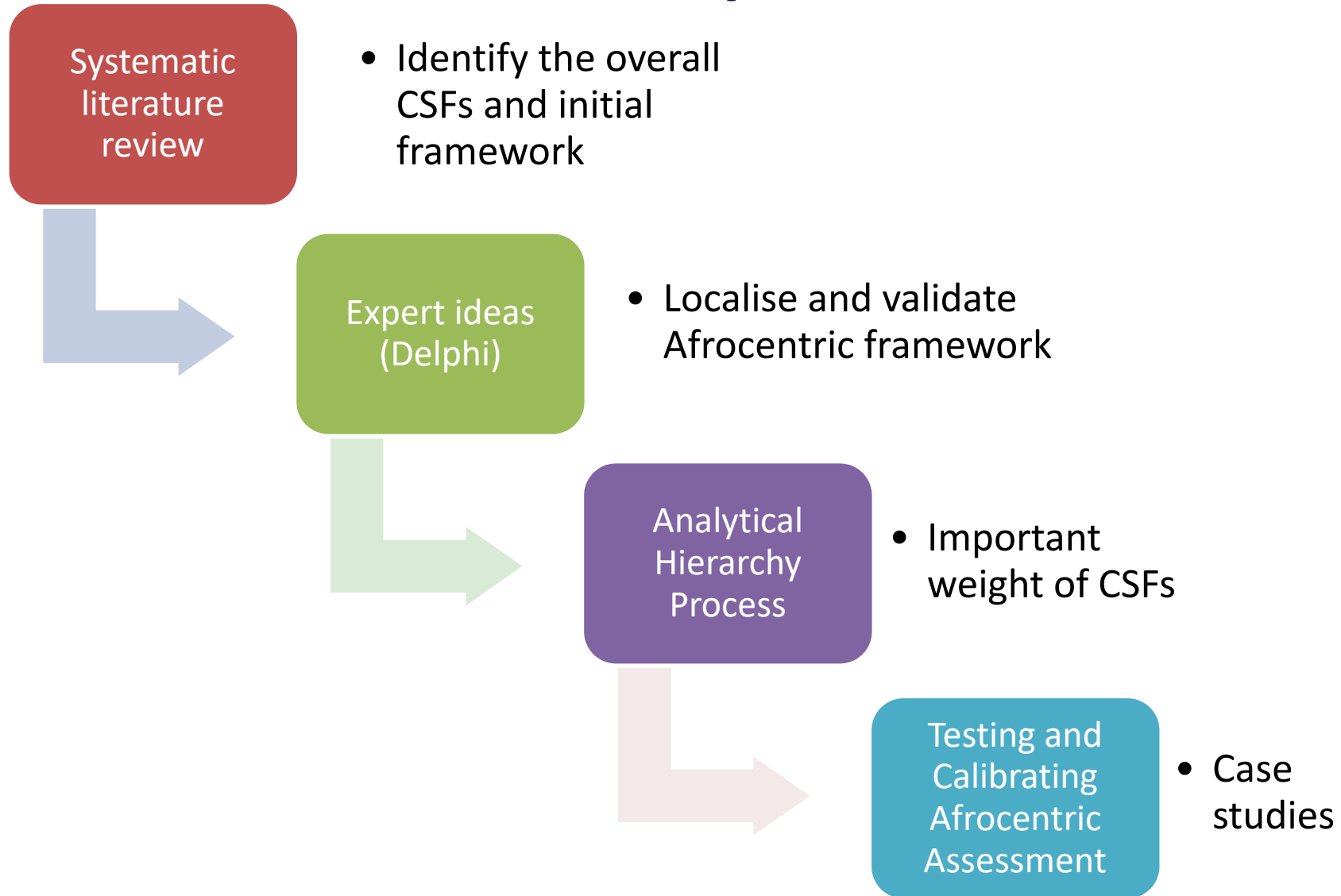

- There is a lack of a local NSA framework for implementing and measuring the sustainability of neighbourhoods in Africa.

AIM

Develop an Afro-centric neighbourhood assessment framework for developing inclusive, sustainable and smart African urban precincts to catalyse economic growth, promote positive social and environmental impact and enhance the QOL of African marginalised communities, particularly in pandemic and post-pandemic conditions.

Research process

Systematic literature review

- Identify the overall CSFs and initial framework

Expert ideas (Delphi)

- Localise and validate Afrocentric framework

Analytical Hierarchy Process

- Important weight of CSFs

Testing and Calibrating Afrocentric Assessment

- Case studies

University of Cape Town · University of Huddersfield · UWE Bristol University of the West of England · Royal Academy of Engineering · Communicare · SOCUBE

Systematic Literature review
Identify CSFs

Methodology

Search setup
- Global approach, considering major international tools that evaluated sustainability and inclusivity indicators in economic, environmental and governance aspects

Search results
- Identified 42 NSA

Analysis
- Selected 7 assessment tools, which are considered on all three pillars of sustainability and are commonly used in Africa
- Content analysis and clustering of relevant CSFs with African local context (expert judgement)

Outputs
- Initial Afro-centric NSA with 86 CSFs

Neighbourhood assessment tools details

Tools	Origin of tool	Geographical area	No of categories	No of factors
Circles of Sustainability	Europe	Global	4	28
ISO37120	International	Global	23	100
GBCSA- Sustainable Precinct	South Africa (Australia)	South Africa	4	69
CASBEE-UD	Japan	Global	7	35
LEED-ND	USA	Global	5	59
BREEAM Communities	UK	Global	5	62
HQE^{2}R	Europe	Global	5	21

Findings
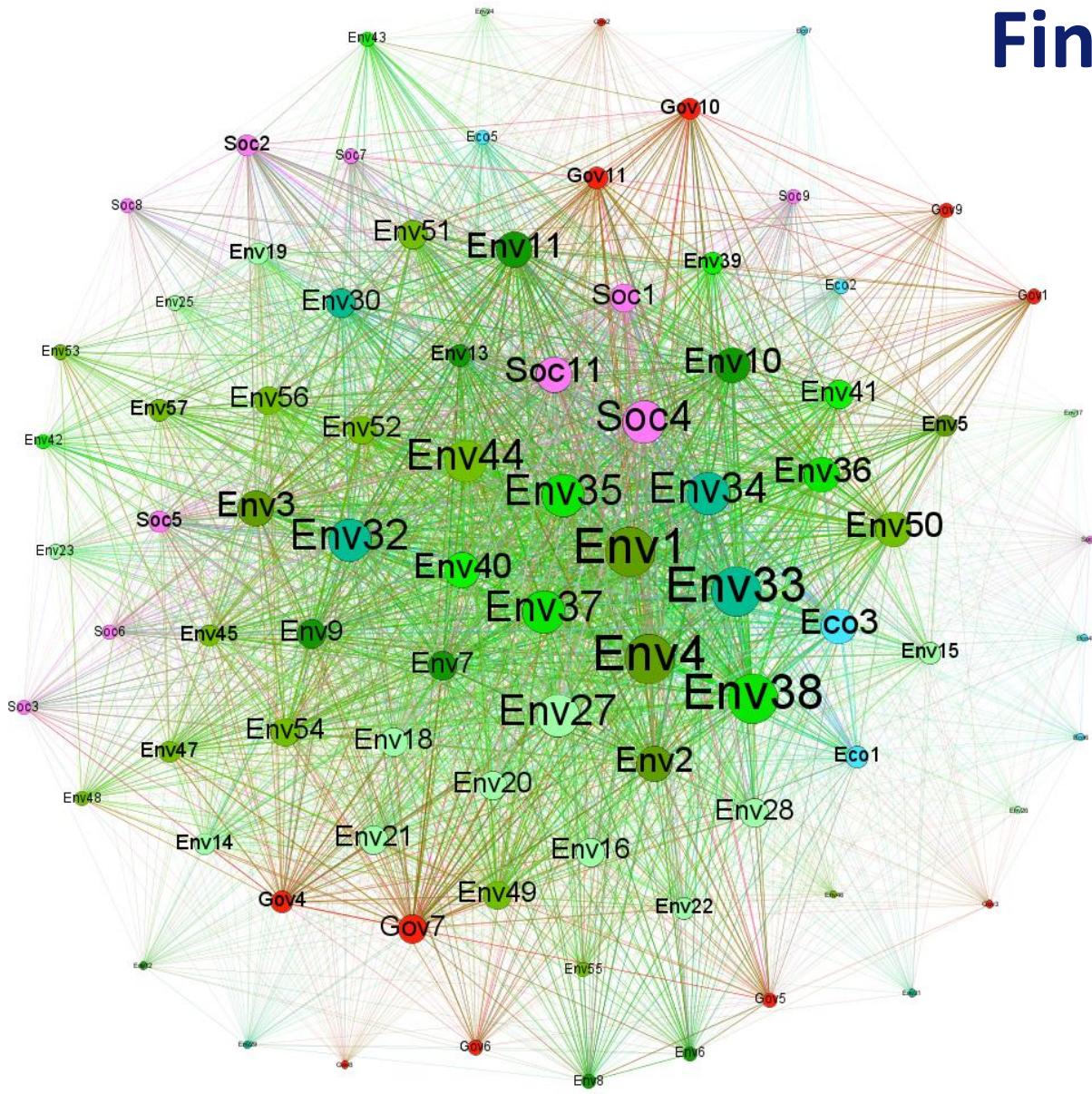
Theme		Number of CSFs	Size of category
Economic		7	8.1%
Environmental	Essential	8	66.3%
	Neighbourhood design	14	
	Infrastructures	15	
	Buildings & Housing	5	
	Mobility	4	
	Pollution & climate	6	
	Resources management	5	
Governance		11	12.8%
Social		11	12.8%

Economic

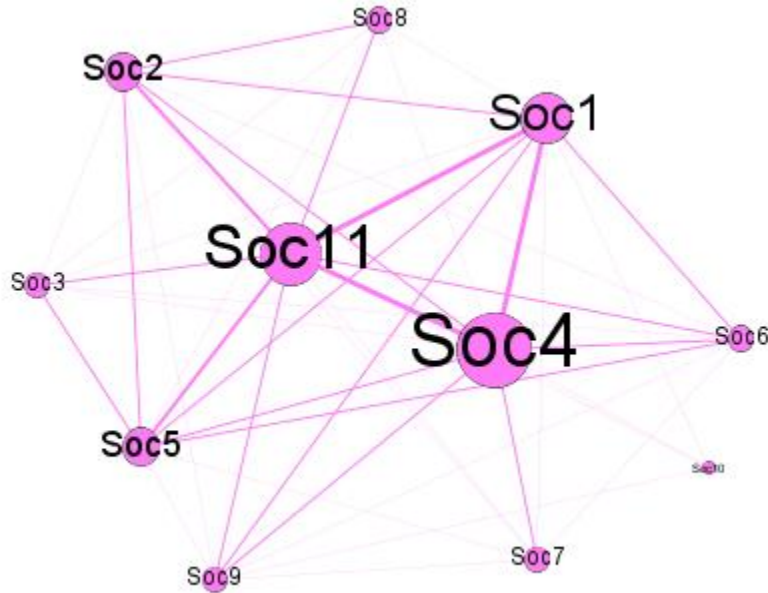| Economic CSFs	Code	Frequency
Supports the local economy, businesses, and jobs	Eco3	5
Added market value/ positive economic impact	Eco1	3
Affordability of the neighbourhood	Eco2	2
Economic resilience, flexibility and adaptability (attractiveness and competitiveness)	Eco5	2
Entrepreneurship/ innovative economy	Eco7	1
Income level of the neighborhood	Eco6	1
Support of national economy	Eco4	1

Environmental
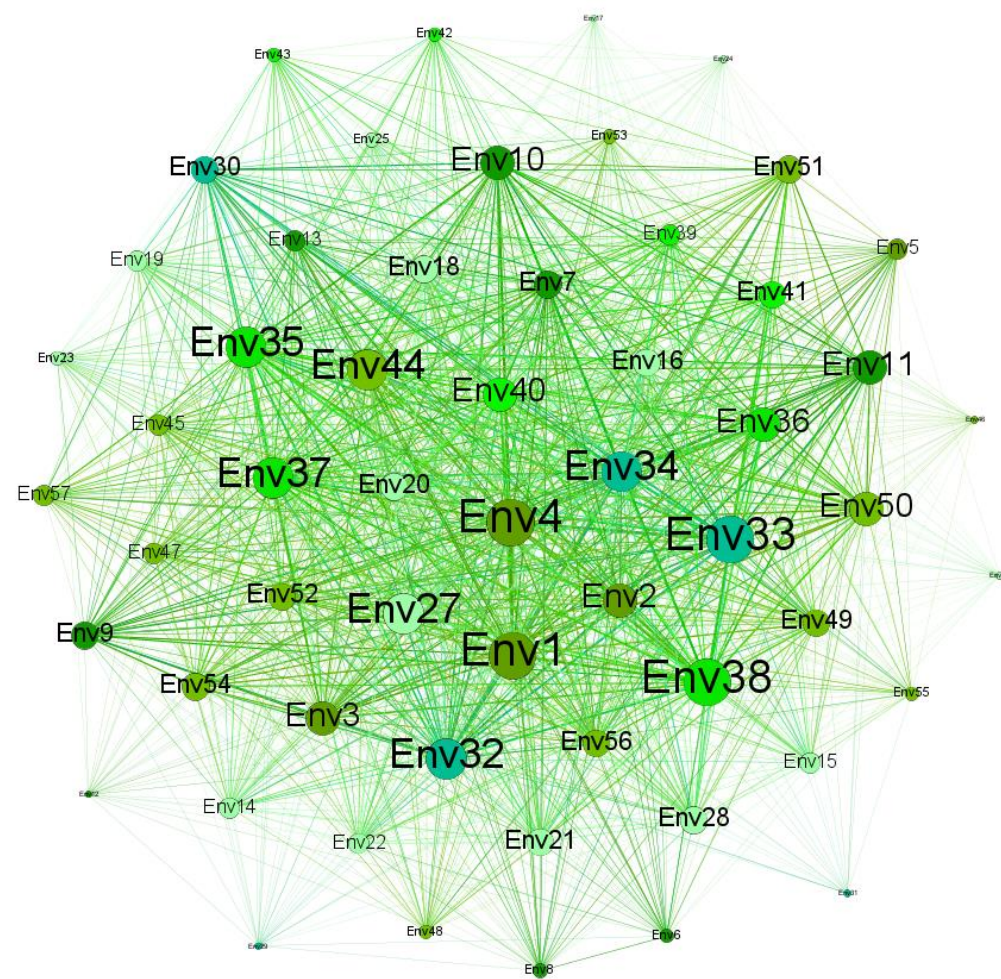
Environmental CSFs	Code	Frequency
Energy use efficiency (electricity, gas)	Env1	7
Water recycling (rainwater harvesting, gey and black system)	Env4	7
Pollution control/ light, sound, electrosmog, and hazardous substances	Env33	7
Distance to the workplace (CBD)	Env38	7
Educational facilities	Env27	6
Preserve Original Habitat and Native Vegetation, habitat protection/ biodiversity and ecosystems preservation	Env32	6
Climate resilience/ reducing greenhouse Gases and Carbon emission	Env34	6
Accessibility and connectivity to the urban transport network	Env35	6
Active mobility	Env37	6
Land preservation/ inventory-based land use	Env44	6

Governance
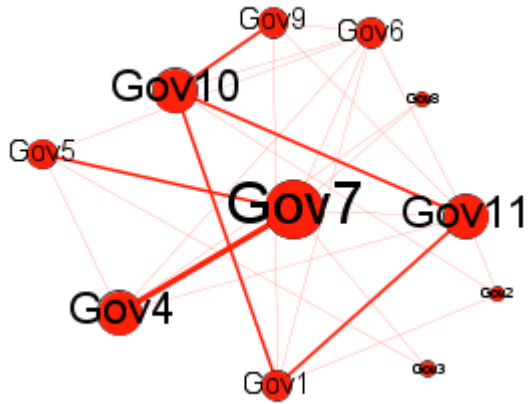
Governance CSFs	Code	Frequency
Innovation and Adaptation/ Automated control system	Gov7	4
Quality of services/ operation-maintenance	Gov4	3
Quality of services/ operation-maintenance	Gov10	3
Managing neighborhood and facilities with communities (community capacity)	Gov11	3
Commitment to sustainability/ future-oriented adaptability	Gov1	2
Efficient and transparency organization and governance	Gov5	2
Urban strategy and planning/ Master Plan /integrated planning	Gov9	2
Interdisciplinary involvement and coordination	Gov2	1
Neighborhood and Facilities management/ proper implementation	Gov3	1
Supervise and monitor by professional	Gov8	1

Social

Social CSFs	Code	Frequency
Culture and heritage identity	Soc4	6
Community satisfaction	Soc11	5
Social cohesion/ social diversity	Soc1	4
Participation/ eco-education/ community center	Soc2	3
Social diversity/ Mixed community, Gender, Generations, culture	Soc5	3
Belonging and Community involvement in neighborhood activities	Soc3	2
Wellbeing and Health of the community	Soc6	2
Safety & security	Soc7	2
Inclusivity/equality of communities	Soc8	2
The employment rate	Soc9	2
Education level/Illiteracy rate	Soc10	1

Research process

Systematic literature review

- Identify the overall CSFs and initial framework

Expert ideas (Delphi)

- Localise and validate Afrocentric framework

Localising Critical Success Factors
Delphi Technique

Methodology

Round 1
- ➢ Validated identified CSFs
- ➢ Reclassifying CSFs
- ➢ Suggested new CSFs

Round 2
- ➢ Consensus on new CSFs
- ➢ Consensus on Afrocentric Neighbourhood assessment

Outputs
- ➢ Afrocentric Neighbourhood assessment with 96 CSFs in 4 categories

Added CSFs by Experts

Category		Code	CSFs
Economic		Eco8	Support marginalised populations (women, youth, etc.) participation in the economy
Environmental	Infrastructures	Env29	Non-motorised transport (end-to-end NMT)
		Env30	Open spaces/Public parks
		Env31	Religious facilities (Diversity of religious facilities accessible to the community)
	Mobility	Env42	Clean/ non-fossil fuel powered mobility (public charging infrastructure for electric mobility)
		Env62	Environment and resources sensitive design (Net-Zero emission fuel-powered)
	Design	Env63	Walkable (Infrastructure to enable walking end to end)
		Env64	Local accessible and affordable food production
Governance		Gov12	Community-level governance and engagement
Social		Soc12	Gender/Racial Discrimination

Afrocentric Nighbourhoods assessmnet

Economic

Eco1: Added market value/ positive economic impact

Eco2: Affordability of neighbourhood

Eco3: Support local economy, businesses, and jobs

Eco4: Support of national economy

Eco5: Economic resilience, flexibility, and adaptability

Eco6: Sufficient income level of neighbourhood

Eco7: Entrepreneurship/ innovative economy

Eco8: Support marginalised populations participation in the economy

Environmental

Resources

Env1: Energy use efficiency

Env2: Use of renewable energies

Env3: Water use efficiency

Env4: Water recycling

Env5: Advanced waste management and recycling strategy

Essential

Env6: Connected to clean water

Env7: Adequate sanitation and connected to sewerage/stormwater

Env8: Connected to reliable energy sources

Env9: Access to local healthy Food

Env10: Disaster resilience/ prevention from extreme natural and man-made disasters

Env11: Minimising material and waste/ recycling and reuse, Waste management

Env12: Drinking water quality

Env13: Air quality

Infrastructure

Env14: Infrastructure maintenance and retrofitting

Env15: IT infrastructure

Env16: Water & water waste infrastructure

Env17: Reliable Energy infrastructure

Env18: Health facilities

Env19: Recreation and entertainment facilities

Env20: Sport facilities

Env21: Recycling facilities

Env22: Police/security facilities

Env23: Waste management facilities

Env24: Shopping facilities

Env25: Smart infrastructures/facilities

Env26: Lighting systems

Env27: Educational facilities

Env28: Transportation network infrastructures

Env29: Non-motorised transport

Env30: Open spaces/Public parks

Env31: Religious facilities

Climate

Env32: Soil control erosion and Fertility

Env33: Using Eco/green/recycle/local materials

Env34: Life cycle assessment of resources

Env35: Preserve Original Habitat and Native Vegetation, habitat protection/ biodiversity and ecosystems preservation

Env36: Pollution control/ light, sound, electrosmog, and hazardous substances

Env37: Climate resilience/ reducing greenhouse Gases and Carbon emission

Mobility

Env38: Accessibility and connectivity to the urban transport network

Env39: Access to effective and reliable public transport

Env40: Active mobility

Env41: Distance to the workplace (CBD)

Env42: Clean/ non-fossil fuel powered mobility

Design

Env43: Diverse housing/buildings typology

Env44: Affordable and adequate housing

Env45: Sustainable/green buildings/housing

Env46: Mixed-use buildings

Env47: Passive building design

Building

Env48: Land preservation/ inventory-based land use

Env49: Preserve natural topography and liveability

Env50: Urban coherence/ used local and cultural character

Env51: Density/ compactness of neighbourhood

Env52: Hierarchy of open spaces/ Spatial system

Env53: Open/Green and blue spaces

Env54: Safe design

Env55: Universal design/ inclusive design

Env56: Neighbourhood design and layout

Env57: Flexibility and expandability of neighbourhood

Env58: Heat island/ Thermal comfort

Env59: Urban development continuity

Env60: Visual quality of landscaping

Env61: Proper location/ consideration of landscapes and ecosystems

Env62: Environment and resources sensitive design

Env63: Walkable

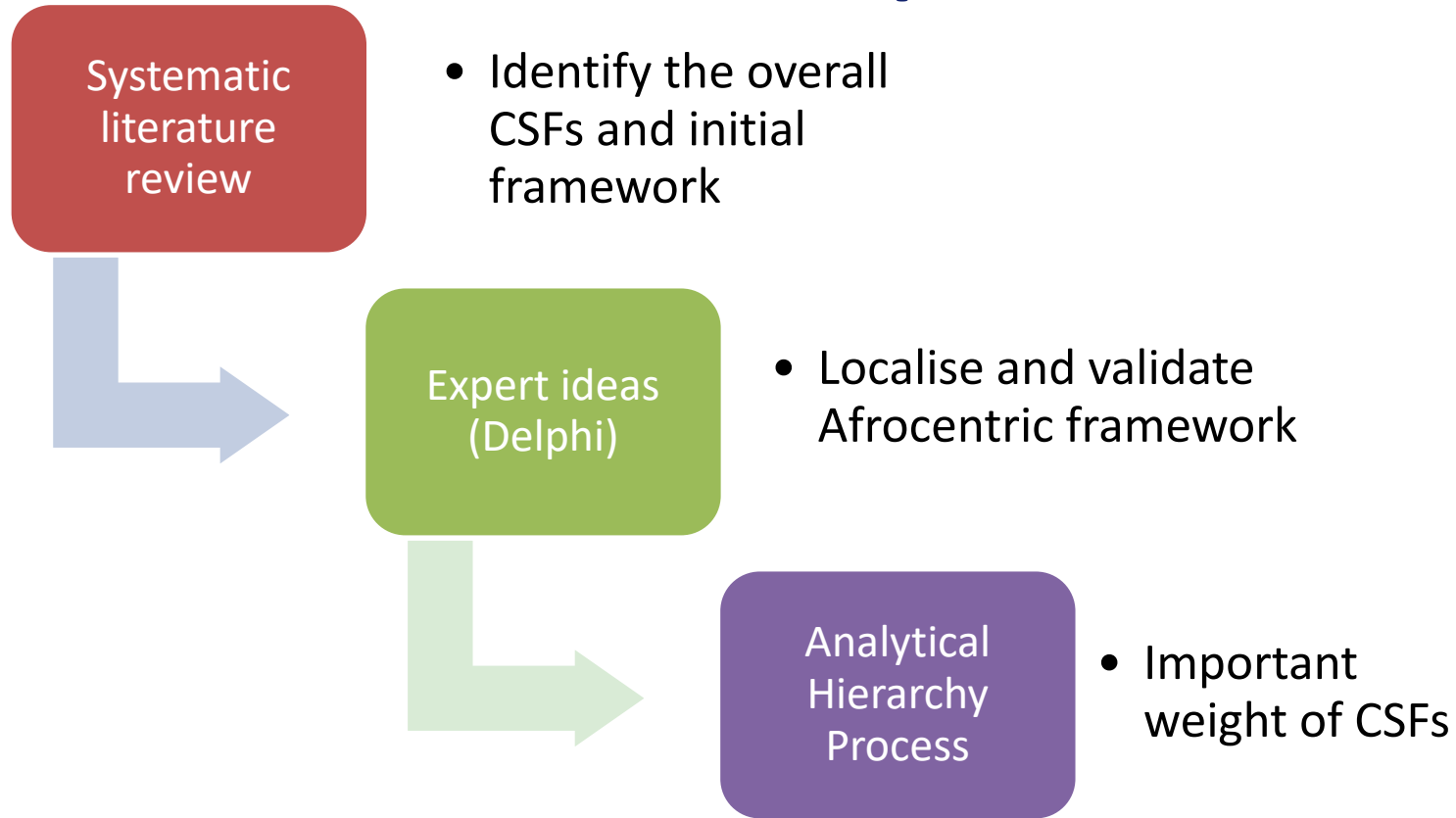**Env64:** Local accessible and affordable food production

Governance

Gov1: Commitment to sustainability/ future-oriented adaptability

Gov2: Interdisciplinary involvement and coordination

Gov3: Neighbourhood and Facilities management/ proper implementation

Gov4: Quality of services/ operation-maintenance

Gov5: Efficient and transparency organisation and Governance

Gov6: Communication with stakeholders and communities and Critique

Gov7: Innovation and Adaptation/ Automated control system

Gov8: Supervise and monitor by professional

Gov9: Urban strategy and planning/ Master Plan /integrated planning

Gov10: Managing neighbourhood and facilities with communities

Gov11: Integrated development strategy/ Advanced project management

Gov12: Community-level governance and engagement

Social

Soc1: Social cohesion/ social diversity

Soc2: Participation/ eco-education/ community centre

Soc3: Belonging and Community involvement in neighbourhood activities

Soc4: Culture and heritage identity

Soc5: Social diversity/ Mixed community, Gender, Generations, culture

Soc6: Wellbeing and Health (QoL) of community

Soc7: Safety & security

Soc8: Inclusivity/equality of communities

Soc9: Employment rate

Soc10: Education level/Illiteracy rate

Soc11: Community satisfaction

Soc12: Gender/Racial Discrimination

Research process

Systematic literature review

- Identify the overall CSFs and initial framework

Expert ideas (Delphi)

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Analytical Hierarchy Process

- Important weight of CSFs

Important weight of CSFs
Analytic Hierarchy Process (AHP)

Methodology

| AHP questionnaire | ➤ Developed pairwise questionnaire in 3 layers: criteria, sub-criteria and CSFs |

| Experts | ➤ Selecting 20 experts on neighbourhood sustainability across Africa
➤ 12 experts agreed to participate
➤ 12 completed questionnaires collected |

| Analysis | ➤ Check the internal consistency of judgments
➤ Calculate the important weights using a comparison matrix
➤ Calculate the inconsistency index (<10%) |

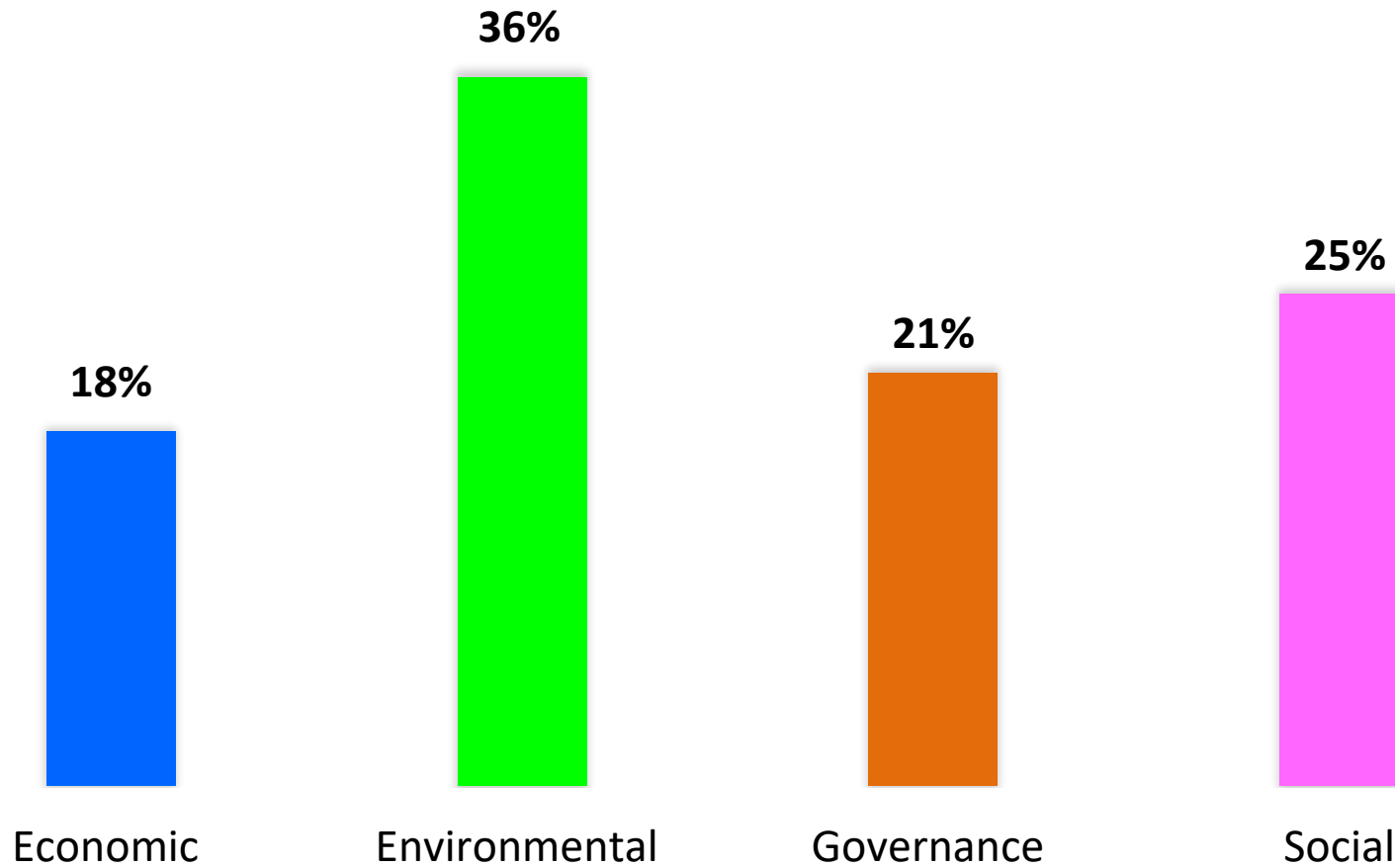| Outputs | ➤ Important weight of criteria, sub-criteria, and CSFs |

Afrocentric Nighbourhoods assessmnet

Economic

Eco1: Added market value/ positive economic impact

Eco2: Affordability of neighbourhood

Eco3: Support local economy, businesses, and jobs

Eco4: Support of national economy

Eco5: Economic resilience, flexibility, and adaptability

Eco6: Sufficient income level of neighbourhood

Eco7: Entrepreneurship/ innovative economy

Eco8: Support marginalised populations participation in the economy

Environmental

Resources

Env1: Energy use efficiency

Env2: Use of renewable energies

Env3: Water use efficiency

Env4: Water recycling

Env5: Advanced waste management and recycling strategy

Essential

Env6: Connected to clean water

Env7: Adequate sanitation and connected to sewerage/stormwater

Env8: Connected to reliable energy sources

Env9: Access to local healthy Food

Env10: Disaster resilience/ prevention from extreme natural and man-made disasters

Env11: Minimising material and waste/ recycling and reuse, Waste management

Env12: Drinking water quality

Env13: Air quality

Infrastructure

Env14: Infrastructure maintenance and retrofitting

Env15: IT infrastructure

Env16: Water & water waste infrastructure

Env17: Reliable Energy infrastructure

Env18: Health facilities

Env19: Recreation and entertainment facilities

Env20: Sport facilities

Env21: Recycling facilities

Env22: Police/security facilities

Env23: Waste management facilities

Env24: Shopping facilities

Env25: Smart infrastructures/facilities

Env26: Lighting systems

Env27: Educational facilities

Env28: Transportation network infrastructures

Env29: Non-motorised transport

Env30: Open spaces/Public parks

Env31: Religious facilities

Climate

Env32: Soil control erosion and Fertility

Env33: Using Eco/green/recycle/local materials

Env34: Life cycle assessment of resources

Env35: Preserve Original Habitat and Native Vegetation, habitat protection/ biodiversity and ecosystems preservation

Env36: Pollution control/ light, sound, electrosmog, and hazardous substances

Env37: Climate resilience/ reducing greenhouse Gases and Carbon emission

Mobility

Env38: Accessibility and connectivity to the urban transport network

Env39: Access to effective and reliable public transport

Env40: Active mobility

Env41: Distance to the workplace (CBD)

Env42: Clean/ non-fossil fuel powered mobility

Design

Env43: Diverse housing/buildings typology

Env44: Affordable and adequate housing

Env45: Sustainable/green buildings/housing

Env46: Mixed-use buildings

Env47: Passive building design

Building

Env48: Land preservation/ inventory-based land use

Env49: Preserve natural topography and liveability

Env50: Urban coherence/ used local and cultural character

Env51: Density/ compactness of neighbourhood

Env52: Hierarchy of open spaces/ Spatial system

Env53: Open/Green and blue spaces

Env54: Safe design

Env55: Universal design/ inclusive design

Env56: Neighbourhood design and layout

Env57: Flexibility and expandability of neighbourhood

Env58: Heat island/ Thermal comfort

Env59: Urban development continuity

Env60: Visual quality of landscaping

Env61: Proper location/ consideration of landscapes and ecosystems

Env62: Environment and resources sensitive design

Env63: Walkable

Env64: Local accessible and affordable food production

Governance

Gov1: Commitment to sustainability/ future-oriented adaptability

Gov2: Interdisciplinary involvement and coordination

Gov3: Neighbourhood and Facilities management/ proper implementation

Gov4: Quality of services/ operation-maintenance

Gov5: Efficient and transparency organisation and Governance

Gov6: Communication with stakeholders and communities and Critique

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Gov10: Managing neighbourhood and facilities with communities

Gov11: Integrated development strategy/ Advanced project management

Gov12: Community-level governance and engagement

Social

Soc1: Social cohesion/ social diversity

Soc2: Participation/ eco-education/ community centre

Soc3: Belonging and Community involvement in neighbourhood activities

Soc4: Culture and heritage identity

Soc5: Social diversity/ Mixed community, Gender, Generations, culture

Soc6: Wellbeing and Health (QoL) of community

Soc7: Safety & security

Soc8: Inclusivity/equality of communities

Soc9: Employment rate

Soc10: Education level/Illiteracy rate

Soc11: Community satisfaction

Soc12: Gender/Racial Discrimination

Economic CSFs Weightings

Code	Economic CSFs	Weight
Eco1	Added market value/ positive economic impact	10%
Eco2	Affordability of neighbourhood	20%
Eco3	Support the local economy, businesses, and jobs	14%
Eco4	Support of national economy	9%
Eco5	Economic resilience, flexibility, and adaptability	15%
Eco6	Sufficient income level of the neighbourhood (%80 of households receive sufficient income to support their households)	12%
Eco7	Entrepreneurship/ innovative economy	7%

Environmental Sub-Criteria Weightings (2nd layer)
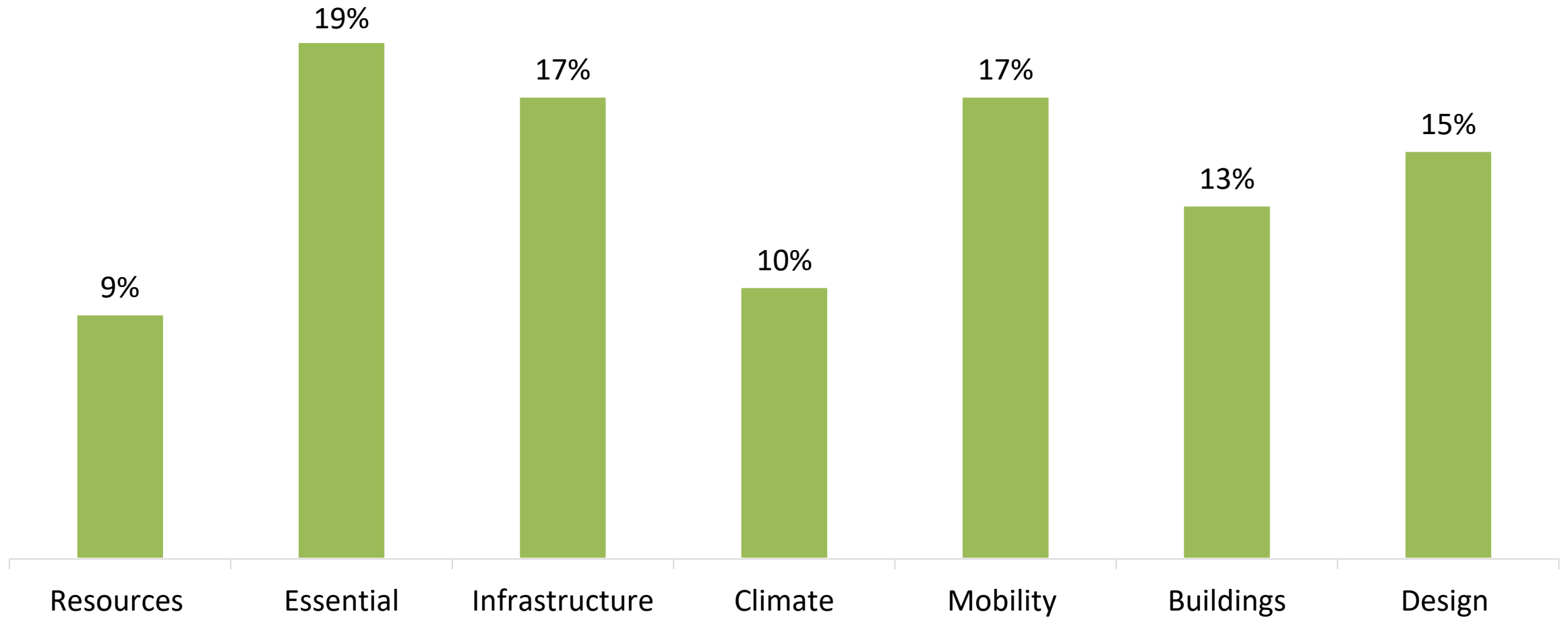
Environmental CSFs Weightings

	Code	CSF	Weight
Resources	Env1	Energy use efficiency (electricity, gas)	28%
	Env2	Use of renewable energies	14%
	Env3	Water use efficiency	25%
	Env4	Water recycling (rainwater harvesting, grey and black system)	16%
	Env5	Advanced waste management and recycling strategy	17%
Essential	Env6	Connected to clean water	18%
	Env7	Adequate sanitation and connected to sewerage/stormwater	16%
	Env8	Connected to reliable energy sources	12%
	Env9	Access to local healthy Food	7%
	Env10	Disaster resilience/ prevention from extreme natural and man-made disasters	18%
	Env11	Minimising material and waste/ recycling and reuse, Waste management	7%
	Env12	Drinking water quality	13%
	Env13	Air quality	9%
Infrastructure	Env14	Infrastructure maintenance and retrofitting	4%
	Env15	IT Infrastructure	5%
	Env16	Water & water waste infrastructure	8%
	Env17	Reliable Energy infrastructure	7%
	Env18	Health facilities	9%
	Env19	Recreation and entertainment facilities	5%
	Env20	Sport facilities	4%
	Env21	Recycling facilities	4%
	Env22	Police/security facilities	8%
	Env23	Waste management facilities	5%
	Env24	Shopping facilities	5%
	Env25	Smart infrastructures/facilities	3%
	Env26	Lighting systems	7%
	Env27	Educational facilities	8%
	Env28	Transportation network infrastructures	8%
	Env29	Non-motorised transport (end-to-end NMT)	3%
	Env30	Open spaces/Public parks	5%
	Env31	Religious facilities (Diversity of religious facilities accessible to the community)	2%

Environmental CSFs Weightings

|	Code	CSF	Weight
Climate	Env32	Soil control erosion and Fertility	9%
	Env33	Using Eco/green/recycle/local materials	11%
	Env34	Life cycle assessment of resources (environmental impact)	20%
	Env35	Preserve Original Habitat and Native Vegetation, habitat protection/ biodiversity and ecosystem preservation	21%
	Env36	Pollution control/ light, sound, electrosmog, and hazardous substances	18%
	Env37	Climate resilience/ reducing greenhouse Gases and Carbon emission	21%
Mobility	Env38	Accessibility and connectivity to the urban transport network	24%
	Env39	Access to effective and reliable public transport	23%
	Env40	Active mobility	17%
	Env41	Distance to the workplace (CBD)	22%
	Env42	Clean/ non-fossil fuel-powered mobility (public charging infrastructure for electric mobility)	14%
Buildings	Env43	Diverse housing/building typology	16%
	Env44	Affordable and adequate housing	26%
	Env45	Sustainable/green buildings/housing	21%
	Env46	Mixed-use buildings	20%
	Env47	Passive building design	17%
Design	Env48	Land preservation/ inventory-based land use	4%
	Env49	Preserve natural topography and liveability	5%
	Env50	Urban coherence/ used local and cultural character	8%
	Env51	Density/ compactness of the neighbourhood	9%
	Env52	Hierarchy of open spaces/ Spatial system	6%
	Env53	Open/Green and blue spaces	9%
	Env54	Safe design	7%
	Env55	Universal design/ inclusive design	7%
	Env56	Neighbourhood design and layout	8%
	Env57	Flexibility and expandability of neighbourhood	5%
	Env58	Heat island/ Thermal comfort	4%
	Env59	Urban development continuity	4%
	Env60	Visual quality of landscaping	3%
	Env61	Proper location/ consideration of landscapes and ecosystems	7%
	Env62	Environment and resources sensitive design (Net-Zero emission fuel-powered)	6%
	Env63	Walkable (Infrastructure to enable walking end to end)	5%
	Env64	Local accessible and affordable food production	3%

Governance CSFs Weightings

Code	CSF	Weight
Gov1	Commitment to sustainability/ future-oriented adaptability	8%
Gov2	Interdisciplinary involvement and coordination	7%
Gov3	Neighbourhood and Facilities management/ proper implementation	11%
Gov4	Quality of services/ operation-maintenance	9%
Gov5	Efficient and transparency organisation and Governance	12%
Gov6	Communication with stakeholders and communities and Critique	11%
Gov7	Innovation and Adaptation/ Automated control system	7%
Gov8	Supervise and monitor by professional	9%
Gov9	Urban strategy and planning/ Master Plan /integrated planning	9%
Gov10	Managing neighbourhood and facilities with communities	7%
Gov11	Integrated development strategy/ Advanced project management	5%
Gov12	Community-level governance and engagement	5%

Social CSFs Weightings

Code	CSF	Weight
Soc1	Social cohesion/ social diversity	8%
Soc2	Participation/ eco-education/ community centre	9%
Soc3	Belonging and Community involvement in neighbourhood activities	10%
Soc4	Cultural and heritage identity	9%
Soc5	Social diversity/ Mixed community, Gender, Generations, culture	7%
Soc6	Wellbeing and Health (QoL) of the community	11%
Soc7	Safety & security	14%
Soc8	Inclusivity/equality of communities	8%
Soc9	Employment rate	6%
Soc10	Education level/Illiteracy rate	5%
Soc11	Community satisfaction	6%
Soc12	Gender/Racial Discrimination	7%

Top 20 CSFs
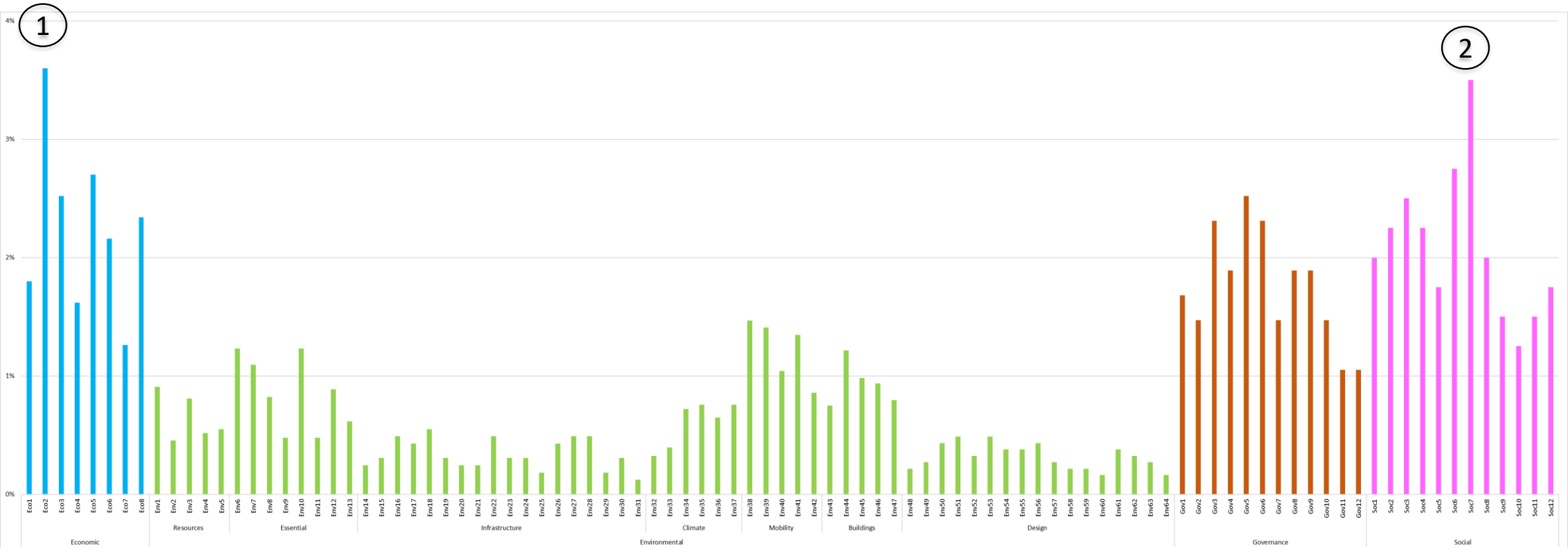
Top 20 CSFs

Eco2	Affordability of neighbourhood	3.60%
Soc7	Safety & security	3.50%
Soc6	Wellbeing and Health (QoL) of the community	2.75%
Eco5	Economic resilience, flexibility, and adaptability	2.70%
Eco3	Support the local economy, businesses, and jobs	2.52%
Gov5	Efficient and transparency organisation and governance	2.52%
Soc3	Belonging and community involvement in neighbourhood activities	2.50%
Eco8	Support marginalised populations (women, youth, etc.) participation in the economy	2.34%
Gov3	Neighbourhood and Facilities management/ proper implementation	2.31%
Gov6	Communication with stakeholders and communities and critique	2.31%
Soc2	Participation/ eco-education/ community centre	2.25%
Soc4	Cultural and heritage identity	2.25%
Eco6	Sufficient income level of the neighbourhood (%80 of households receive sufficient income to support their households)	2.16%
Soc1	Social cohesion/ social diversity	2.00%
Soc8	Inclusivity/equality of communities	2.00%
Gov4	Quality of services/ operation-maintenance	1.89%
Gov8	Supervise and monitor by professional	1.89%
Gov9	Urban strategy and planning/ master plan /integrated planning	1.89%
Eco1	Added market value/ positive economic impact	1.80%
Soc5	Social diversity/ mixed community, gender, generations, culture	1.75%
Soc12	Gender/racial discrimination	1.75%

Ongoing activities

- Testing the Afrocentric Neighbourhood framework on 4 case studies
- Publishing research findings
- Expanding the study to UK and Brazil
- Networking to find partners in India and China to expand the study

THANK YOU