

# Local Bamboo as a Cost-Effective Construction Material for Daily Use Wheelchairs and Sports Chairs: Increasing Mobility Accessibility for Persons with Disabilities in Socioeconomically Disadvantaged Settings

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# International Paralympic Committee (IPC)

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## **Vision**

Make for an inclusive world through Para sport.

## **Mission**

To lead the Paralympic Movement, oversee the delivery of the Paralympic Games and support members to enable Para athletes to achieve sporting excellence.

# My inspiration



**Maclean Atsu Dzidzienyo**  
Ghanaian Paralympic Athlete

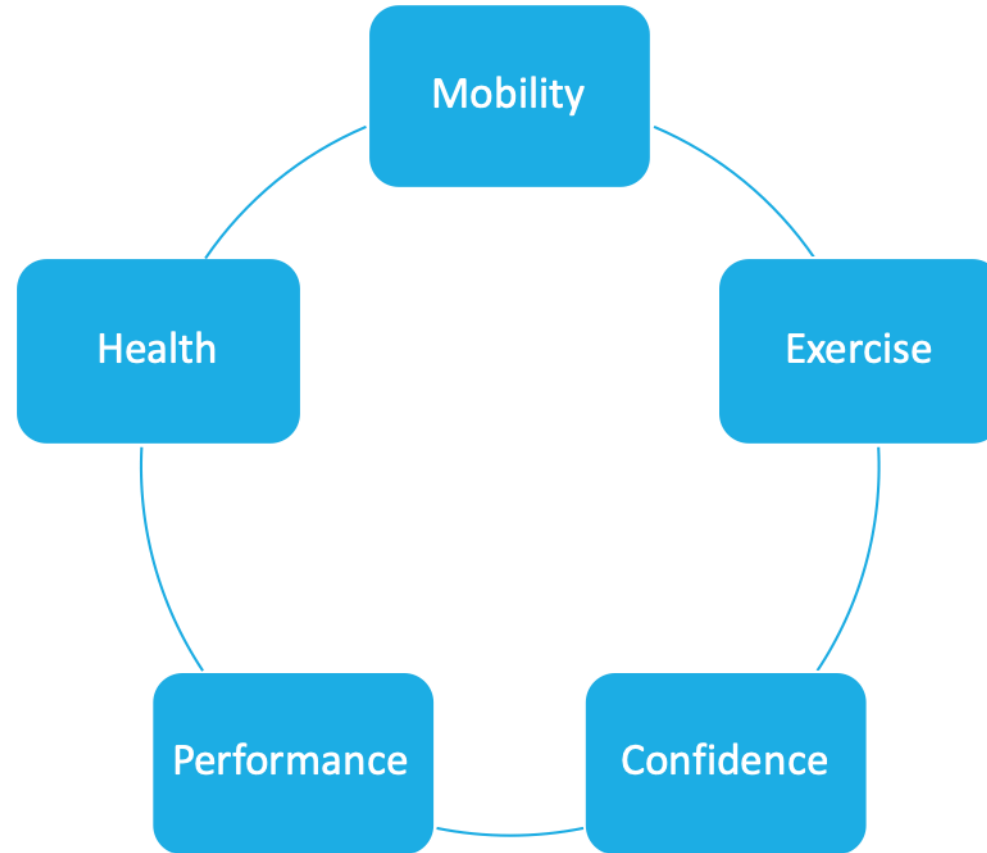


**Raphael Botsyo**  
3-time Paralympian for Ghana



# Interlinked elements<sup>1,2</sup>

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# Paralympic values

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- ❖ Courage
- ❖ Determination
- ❖ Equality
- ❖ Inspiration



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How can we **increase** the *accessibility* of *mobility* for persons with disabilities in socioeconomically disadvantaged settings?

# Importance of mobility

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Globally, immobility is associated with:

- ❖ Increased poverty rates<sup>3</sup>
- ❖ Social stigmatization<sup>3</sup>
- ❖ Higher rates of chronic disease<sup>4</sup>
- ❖ Higher rates of mental illness<sup>5</sup>



*Ayishetu Seidu – Ghanaian wheelchair racer*

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# Bamboo wheelchair

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5- 15% of 65 million people have access<sup>2,3</sup>

Excess of bamboo used for many applications



# Urban design



# Rural design



# Specifications

	Urban Design	Rural Design
Weight (kg)	~10 kg	~11 kg
Seat height* x width x depth (cm)	46.5 x 32 x 38.5	46.5 x 43 x 38
Total height (cm)	72.5	71
Total width (at rear wheels)	32	42
Total length (cm)	82	93
Estimated production time (hr.)	16	16
Estimated cost of goods (USD)**	110	120

\* measured at the back of the seat

\*\* based on prices in Ghana



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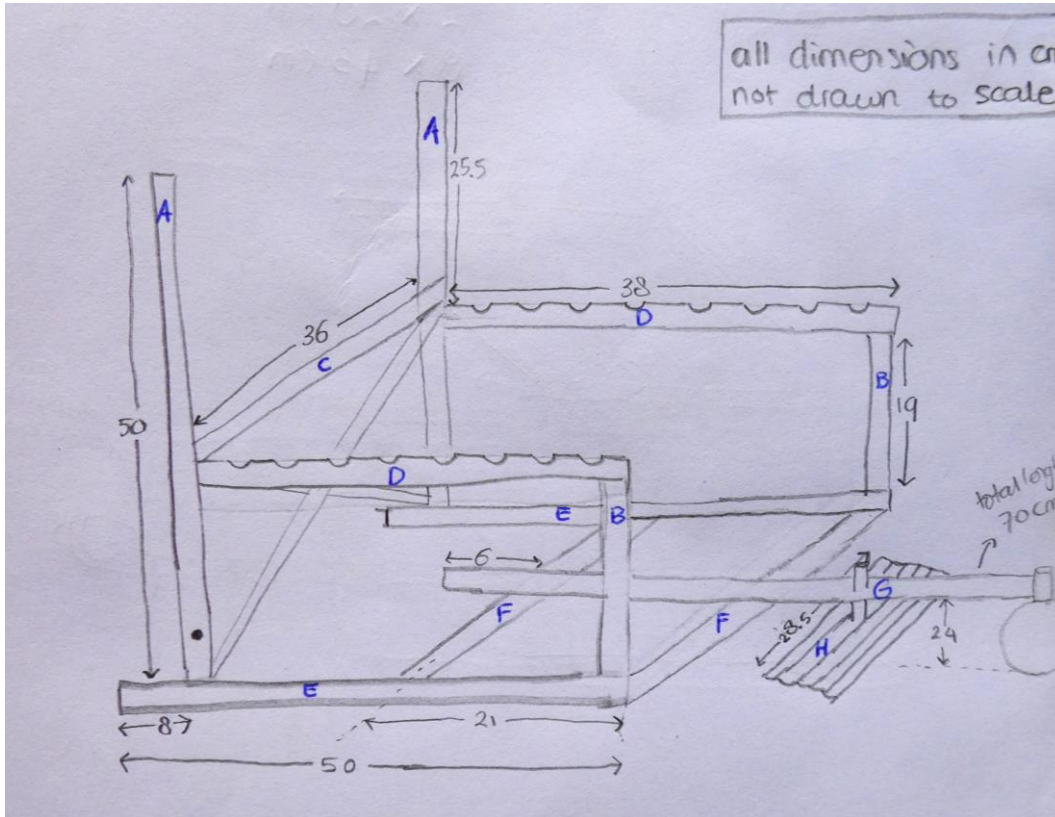


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# Design process



Sketches of the rural bamboo wheelchair design



Bamboo used for construction

	A	B	C	D	E	F	G	H
Inner Ø [mm]	30	35	37	40	23	25	32	23
Outer Ø [mm]	17	20	20	12	15	18	17	15

Diameters of the bamboo poles used in the wheelchair design

# Most important design considerations

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## Material properties bamboo

- Variation amongst bamboo
  - Age
  - Moisture content
  - Origin
  - Part of stem
- High compressive strength

## Ease of design/construction



*Close-up view of the joints of the bamboo wheelchair*





# Cost analysis

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Regular Wheelchair	Bamboo Wheelchair
90 USD	120-130 USD



*Regular foldable wheelchair from  
Tonaton, Accra, Ghana*



*Bamboo wheelchair, Paris,  
France*



# What distinguishes the bamboo wheelchair over others?

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## ❖ Cultural pride

- Empowerment of individuals

## ❖ Accessibility

- Easily custom-made
- Functional

## ❖ Sustainability

- Local and natural resources



*Team member Eric Asante riding the first prototype*



Yale University



Universiteit Utrecht

Future of the  
bamboo  
wheelchair...

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# Conclusion

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Increase the *accessibility* of *mobility* for persons with disabilities in socioeconomically disadvantaged settings:

- ❖ With abundant natural local materials
- ❖ In collaboration with local people
- Expand global participation in the Paralympic Movement
- Make for an inclusive world through Paralympic sport

# Conflict of interest disclosure

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<input checked="" type="checkbox"/>	No, nothing to disclose
<input type="checkbox"/>	Yes, please specify:

# References

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Bright Generation Community Foundation, BGCF

