Republic of Rwanda

Ministry of Infrastructure

MININFRA - RHA Contribution to the Rapid Planning Stakeholder Conference

Rwanda Green Building Indicators

RAPID PLANNING
www.rapid-planning.net

Rwanda Policies

…encourage the efficient use of local, green and affordable building materials.

- National Green Growth and Climate Resilience Strategy 2011
- EDPRS2 2013-18
- National Housing Policy 2015
- Ministerial Order Determining Urban Planning and Building Regulations 2015

  (with UPC and BC)

Environmental soundness
Resource- and cost-efficiency including energy efficiency
Resiliency
Green economy and mainstreaming
Local construction industry enhancement
Affordability

National Housing Policy 2015

4, Policy Pillar 2: "Resource-Efficient Planning, Green Technology and Professionalism
The production of construction materials shall be "green", considering any energy input required, carbon dioxide output reduction, labor creation, and ensuring no cause of reduction in food production. "

Urbanization and Rural Settlement Sector Strategy

Outcome 5: Increased private sector activity in urbanization and human settlement development
Indicator 11: Percentage of building permits applying green building / growth principles
Target 2018: 50
Status: Not known. New auditing framework adopted to enable monitoring.

Output 12: Investment incentives schemes for affordable housing construction offered by government
Affordable housing incentives have been clarified. Green building incentives are not yet concluded due to the unfinished work on the definition of green criteria for Rwanda.

Ministerial Order Determining Urban Planning and Building Regulations 2015

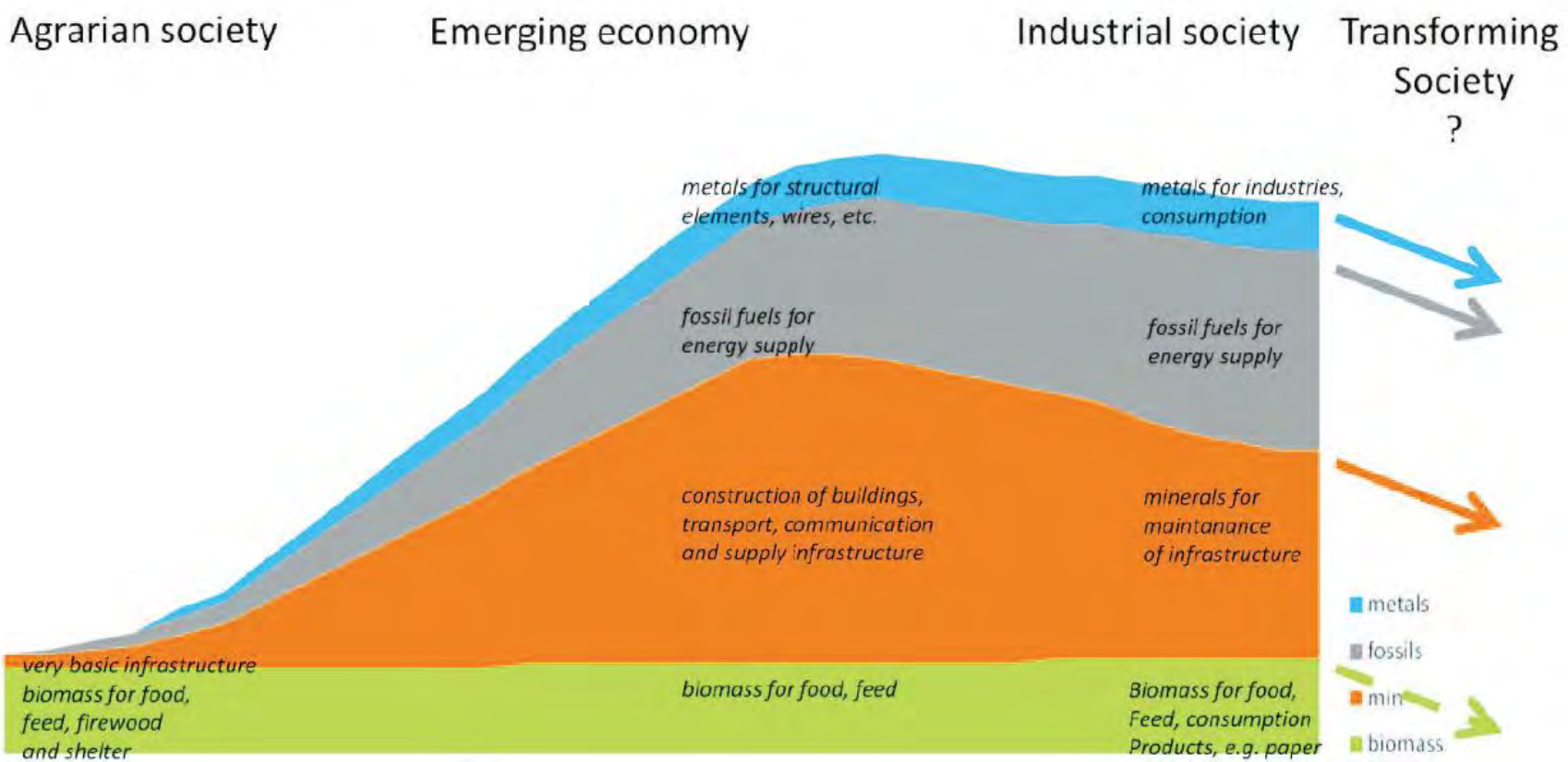
Among the Minimum Building Performance Requirements (Art. 16) stated are:

- environmental soundness;
- efficient and effective use of resources;
- energy efficiency and use of renewable energies;
- rain and surface water harvesting; natural lighting and ventilation;

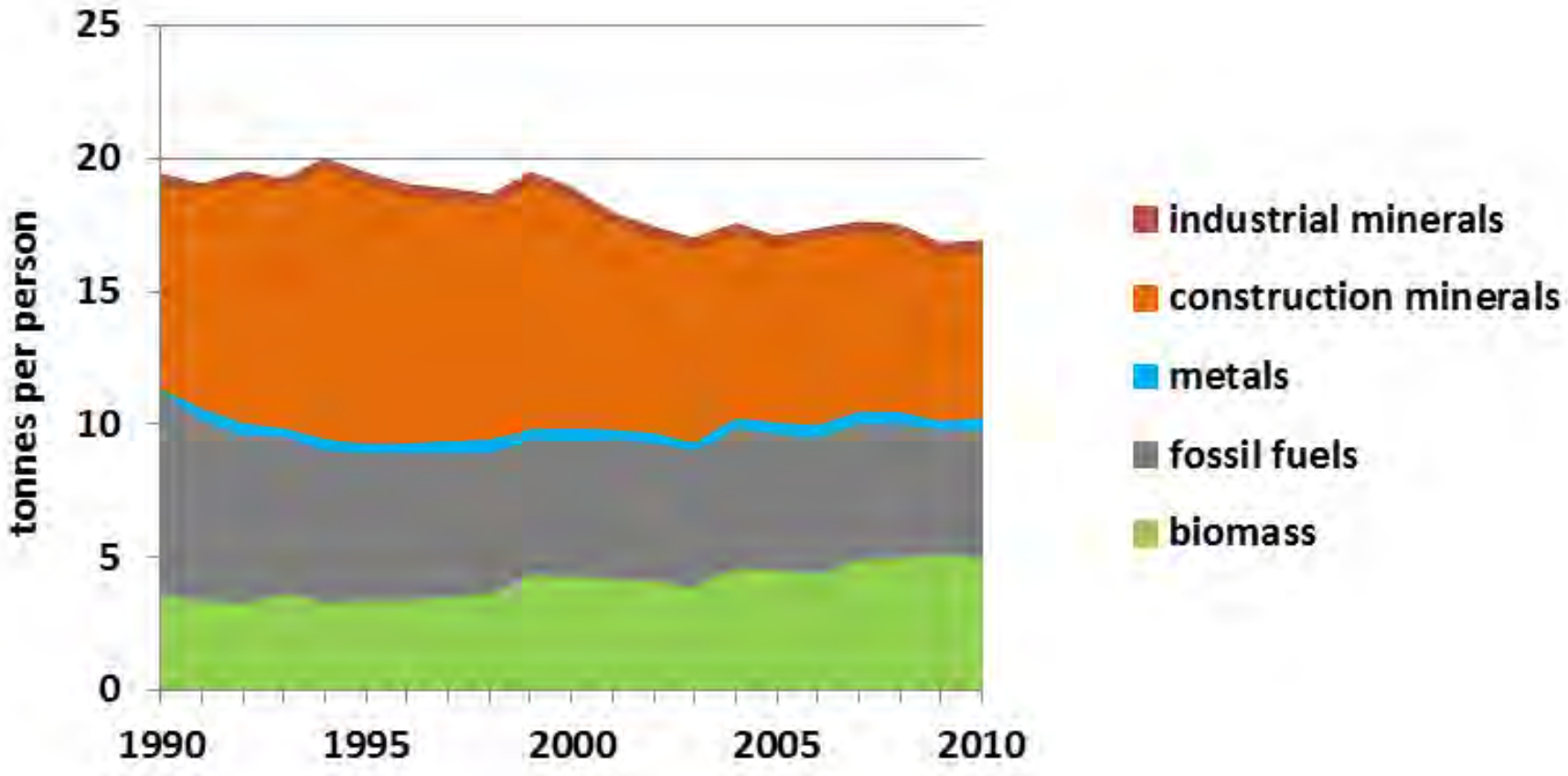
Urban Planning Code (UPC), Building Code (RBC), 2015

- UPC with density requirements, environmentally sensitive areas, and planning for water, waste water management, erosion control and waste management
- RBC makes green building a standard, and opens room for incentivising additional measures

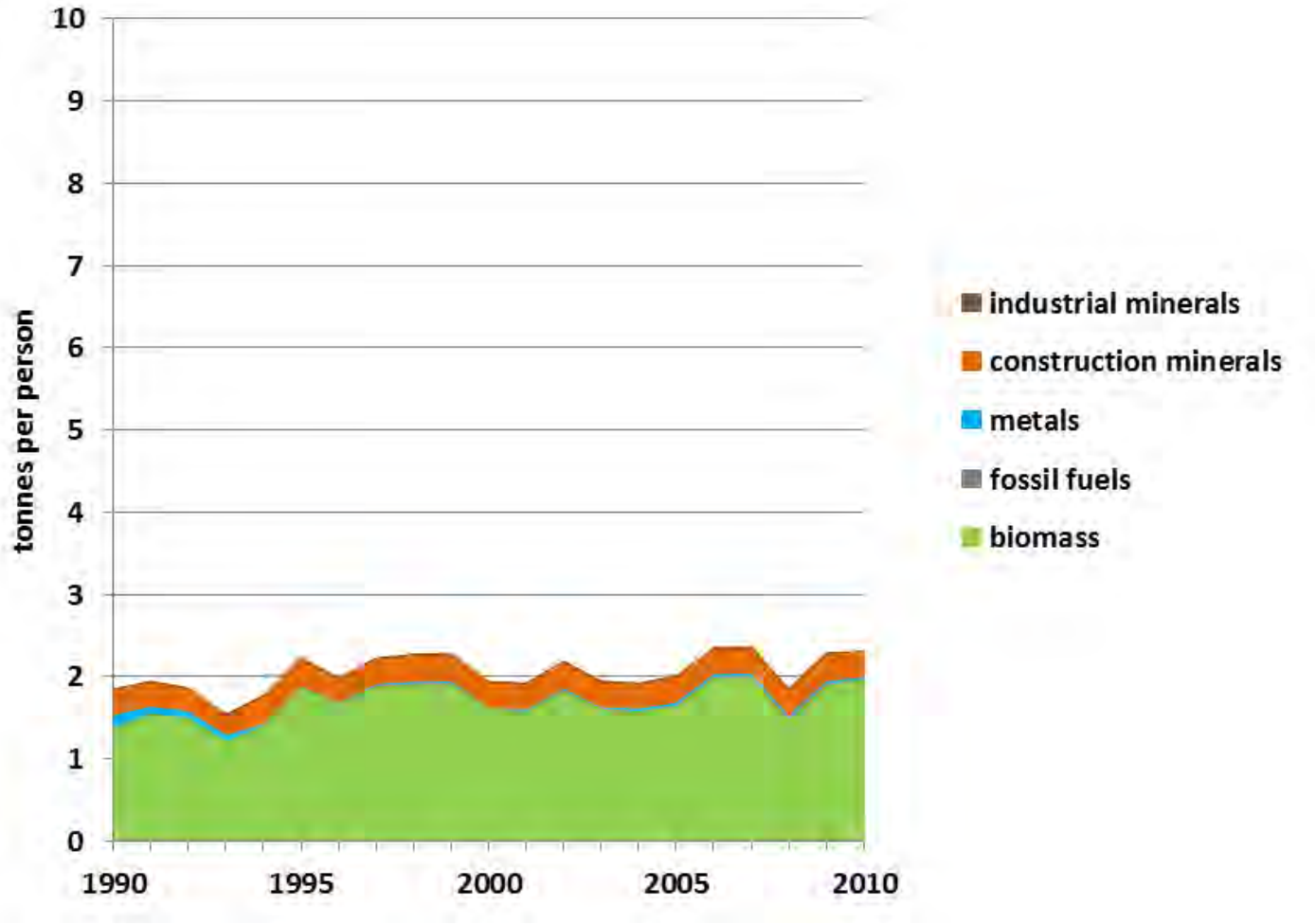
Typical material consumption evolution during development



Material consumption in Germany



Material consumption in Rwanda



Process of establishing green building standards in Rwanda

RBC 6.15.2.: Green *is* standard

→Green building standards definition and adoption

1

1- Pre-selection of indicators

2

2- Life-cycle assessment modelling for building shell *with quantification of - Material mass, Material cost, Greenhouse gas (GHG) emissions, Cumulative energy demand, Land consumption, Water consumption*

- Data gathering primarily from Rwandan manufacturers, generic data (e.g. metal supply chain from Ecoinvent-3 database.
- Modelling in Umberto®, Results extracted to Excel spreadsheet for ease-of-use

3

3- Verification of impact and final indicator selection incl. others besides materials

4

4- Testing

5

5- Implementation

RBC: 6.15.3: Green building incentivised added measures

Institution: Green Building Council (from Nov. 2016)

Pre-selected Indicators (Quantifiable)

Green indicator	Resource consumption benchmarking
Climate change impact	• GHG emissions for construction of per m^2 net floor area • Amount of temporary carbon storage in building • GHG for end-of-life options (landfill/incineration/recycling)
Energy demand for construction	• GJ of (non-) renewable energy demand for construction
Energy demand for operation	• GJ of (non-) renewable energy demand for operation, e.g. electricity for lighting, machines, air conditioning, warm water generation
Land consumption and food security	(agricultural/forest/irreversible) • m2 * year of land use per dwelling unit
Impact on water resources	• Freshwater demand
Impact on other resources	• Mineral resources, metals
Support of local economy	• Transport demand t/km

Preselected Indicators (Qualitative)

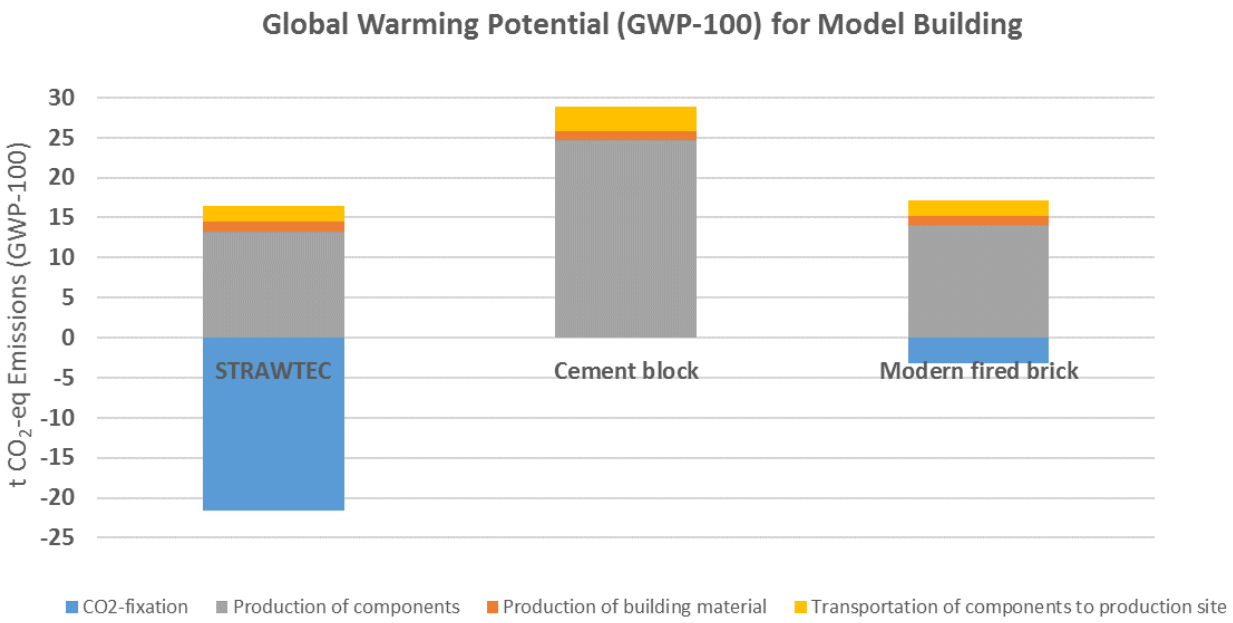
Green indicator	Requirement
Rainwater harvesting	• Tank sized for year-round autonomy for use of water other than human consumption • Tank sized to supplement use of piped water
Site erosion control measures	• Storm-water management and erosion control plan submitted • Impermeable surfaces on the plot are less than xx % • Soil stabilization and structural measures to control energy, velocity, and volume of storm water runoff on site
Building design	• Natural ventilation / Natural lighting provided
Liquid waste treatment	• Primary (mechanical) treatment provided • Waste water treated in different stages
Solid waste treatment	• Solid waste separation on site (organic/non-organic) • Segregation of non-organic wastes • Form work and scaffolding for construction is reusable multiple times
Existence of autonomous solar water heating	(Relevant where there is a hot water heating requirement)
Use of power generated from renewable energies (solar, wind, water)	• Autonomy through renewable energy generation • Partial use of own generated renewable energy • Renewable energy fed into grid

Building Material Calculator Case Studies: CO2 emission

FONERWA 3-storey building

CO2e emission / GWP balance (below)

- Carbon fixation offsets process emissions from sheet metal components;
- STRAWTEC with negative CO_2-e emissions;
- Use of energy embedded in panels at end-of-life of a building needs to be ensured.



Approaching the requirement quantification

Climate change impact

RWANDA DISCUSSION

- Total per capita CO2e emissions in 2015 in Rwanda:
  - 0.7 tons
- Long-term max. cap proposed:
  - To not exceed 2.0 tons CO2e per capita and year
  - Total of buildings to not contribute more than 20% of GHG total over their lifetime

GLOBAL REFERENCE

- Total per capita CO2e emissions in 2013, high / middle income countries :
  - 11 tons / 3.9 tons
- Long-term policy goal by 2050:
  - Reduce to 2.0 tons CO2e per capita and year
  - Total of buildings to not contribute more than 20% of GHG total over their lifetime

Building Material Calculator Case Studies: Indirect land consumption

Building area 80 m^2, assumed lifetime 50 years = 4.000 m^2 *a

Building (Type of outer shell)	Land use / Land consumption			
	agriculture	extraction	forest	other
	*m2 * a*	*m2 * a*	*m2 * a*	*m2 * a*
Adobe bricks	1,820	8	60	57
Cement blocks	0	7	17	51
Concrete walls	1	14	36	111
Hydraform	0	10	29	99
Modulus bricks	0	5	12	39
RULIBA bricks	0	4	179	62
Modern fired brick	0	4	152	33
STRAWTEC	819	1	36	18
Traditional fired brick	5	4	8,255	52

Approaching the requirement quantification

Land consumption

RWANDA DISCUSSION

- Long-term non-compromised food security (limited irreversible indirect consumption of agricultural land)
- Better land use planning and management to avoid building activities on fertile agricultural land
- To not expand agricultural area on the expense of forest and indigenous vegetation
- Limited direct land consumption (existing density requirements)
- Controlled consumption of forest; more efficient use of biomass

GLOBAL REFERENCE

- ~ 2 % of global land area is covered by cities and infrastructures (built-up land) this area is growing to 4-5 % by 2050;
- The built-up areas in developing countries through urbanization will increase 3-fold by 2030;
- In 2007, around 3/4 of the new settlement area in the EU-27 was on former agricultural land;
- Interim "SOS orientation value" 0.20 ha of cropland per person in 2030 (in developed countries, expansion of cropland to be halted).

(UNEP)

Thank you!