

# Rwanda Vision 2050 Objectives

Rwanda Vision 2050 Objectives	Rwanda Vision 2050 Indicators	Links
Quality wellbeing	<b>1. Life expectancy (years)</b> Baseline (2020): 67.8 Target (2035): 71.7 Target (2050): 73	Access to clean cold-chain will: <ol style="list-style-type: none"> <li>i. Improve access to safe and nutritional food. In Rwanda, 20% population is estimated to be food insecure (WFP, 2018). The country also has one of the highest rates of prevalence of child stunting in the world with 33% (NISR et al., 2021). Stunting increases risks of chronic diseases and early mortality. Undernutrition is responsible for 45% of deaths among children under 5 years in developing countries (WHO, 2021). It also leads to weakened immune system, increasing the risk of infectious diseases which could result in death (França et al., 2009).</li> <li>ii. improve access to vaccines blood and medicines. Rwanda has achieved a 98% childhood vaccination rate (2015) through its successful immunization programme, and as of June, 2022 has vaccinated over 60% of its population against Covid-19 (Ritchie et al., 2020). To continue to meet the vaccination needs of the rising population (including pandemic response) along with other healthcare needs such as insulin, blood, and other medicines, improving and expanding the health cold-chain will be critical taking into account changing needs, such as ultra-low temperature requirements of mRNA vaccines<sup>1</sup>, and the environmental impact of cold-chain equipment deployed.</li> <li>iii. reduce GHG emissions and air pollution. Access to cold-chain will reduce the food loss which is responsible for about 16% of the total CO<sub>2</sub>e emission in Rwanda (WB, 2020c). Developing the cold-chain along conventional patterns, relying on fossil fuel energy sources, inefficient technologies and climate polluting refrigerants (HFCs) will add significant GHG emissions and pollution, which can easily detract from the benefits gained from reducing the emissions from food loss with significant impacts on health. In Africa, air pollution was responsible for an estimated 1.1 million premature deaths in 2019 and was the second largest cause of death (UNEP, 2021).</li> </ol>
	<b>2. Population growth rate</b> Baseline (2019): 2.5 Target (2035): 1.7 Target (2050): 1.4	Access to clean cold-chain improve economic empowerment of women. Many studies suggest an inverse relationship between fertility rate and women empowerment (Upadhyay et al., 2014). A recent study conducted in Sub Saharan Africa found that facilitating women empowerment through paid employment, improving access to and control over resources and improving position in productive sectors could significantly reduce the ideal number of children (Atake and Gnakou Ali, 2019).
<b>3. Fertility rate (total births per woman)</b> Baseline (2020): 4.1 Target (2035): 3 Target (2050): 2.3		
Inclusive accelerated economic growth	<b>4. GDP per capita (USD)</b> Baseline (2019): 837 Target (2035): 4,036 Target (2050): 12,476	Access to clean cold-chain will: <ol style="list-style-type: none"> <li>i. Improve agricultural output and farmers' income by reducing both qualitative and quantitative food losses.</li> <li>ii. Provide value addition opportunities with access to processing facilities.</li> <li>iii. Improve access to higher-value markets.</li> <li>iv. Increase domestic trade and international trade.</li> <li>v. Facilitate innovation and competition amongst equipment manufacturers and service providers, contributing to economic growth.</li> </ol>

<sup>1</sup>With mRNA vaccine technology being tried against all the remaining targets for vaccine prevention (e.g., TB, malaria and HIV), ultra-low temperature health cold-chain will be increasing relevance.

	<p><b>5. Gini Coefficient</b> Baseline (2017): 0.43 Target (2035): 0.35 Target (2050): 0.30</p>	<p>i. The clean cold-chain development will need to be supported by inclusive and equitable business models to ensure fair distribution of costs and revenues among all stakeholders, considering poor, disadvantaged and marginalized farmers and their communities, as well as women and youth. According to the Fifth Integrated Household Living Conditions Survey 2016/2017, 63% of working females in Rwanda are in agriculture related occupations compared to only 43% among working males (NISR, 2018). Hence, equitable access to cold-chain will particularly benefit women in Rwanda where agricultural productivity gap was estimated to be approximately 12% in 2013–2014 (UN Women and UNDP-UNEP PEI, 2017).</p> <p>ii. Access to refrigeration at home would increase productive time for income-generating activities for women and would also enable new mothers to work with access to storage for their breast milk.</p>
Employment creation	<p><b>6. Unemployment rate (%)</b> Baseline (2019): 15.2 Target (2035): 7 Target (2050): 5</p>	Development of a clean cold-chain will facilitate creation of new jobs throughout the cold-chain both direct due to increase in cold-chain capacity and indirect through the market movement and connectivity.
	<p><b>7. Ratio of male to female in labour force participation</b> Baseline (2020): 1.8:1 Target (2035): 1.5:1 Target (2050): 1:1</p>	<i>See points ii under indicator 5. Gini Coefficient.</i>
Access to affordable, high-quality and specialized health care	<p><b>8. Maternal mortality rate (per 100,000 live births)</b> Baseline (2020): 203 Target (2035): &lt;50 Target (2050): &lt;20</p>	<p>Access to clean cold-chain will</p> <p>i. improve access to safe and nutritional food. Poor diet during pregnancy can cause anaemia, pre-eclampsia, haemorrhage, and death in mothers. It can also lead to stillbirth, low birthweight, wasting and developmental delays for children (UNICEF, 2020).</p> <p>ii. improve access to vaccines for maternal immunisation, which prevents infant morbidity and mortality as well as provides direct protection to the mother.</p>
	<p><b>9. Infant mortality rate (per 1,000 live births)</b> Baseline (2020): 33 Target (2035): &lt;25 Target (2050): &lt;18</p>	
	<p><b>10. Under Five Mortality Rate (per 1,000 live births)</b> Baseline (2020): 45 Target (2035): 33 Target (2050): 24</p>	<i>See points i under indicator 1. Life expectancy.</i>
	<p><b>11. Child Stunting (%)</b> Baseline (2020): 33 Target (2035): 5.5 Target (2050): 3</p>	

<b>Access to affordable high-quality education</b>	<b>12. Net Enrolment Rate in pre-primary (%)</b> Baseline (2019): 24.6 Target (2035): 99 Target (2050): 99	Access to clean cold-chain will: <ol style="list-style-type: none"> <li>i. improve farmer's income and food security. This will in turn reduce the pressure on farmers to make their children work, which will improve children's ability to attend a school, their learning outcomes and chances of productive employment opportunities later on in life.</li> <li>ii. Space cooling needs can also be integrated into the cooling infrastructure to improve thermal comfort of school buildings for students especially during hot days, which will improve their performance and learning outcomes.</li> <li>iii. improve access to safe and nutritional food. Stunting reduces cognitive capabilities, language and sensory-motor capacities, mental development, school performance and intellectual capacity (Weatherspoon et al., 2019). Furthermore, malnourishment during pregnancy affects physical and mental capacity of children, perpetuating poverty and hunger across generations (Nyaradi et al., 2013; Walker et al., 2007).</li> <li>iv. reduce GHG emissions and air pollution. There is also a direct link between air pollution and cognitive function. Exposure to air pollution during pregnancy and early childhood can reduce cognitive function of children, which in turn can reduce lifelong economic productivity (UNEP, 2021).</li> <li>v. Cold-chain development will also create opportunities for research and development in the agriculture sector and food value chains.</li> </ol>
	<b>13. Percentage of learners achieving at least minimum proficiency in numeracy and literacy in S3<sup>2</sup> (%)</b> Baseline - Numeracy (2017): 78.8 Baseline - Literacy (2017): 71.3 Target (2035): 99 Target (2050): 99	
	<b>14. Transition rate from primary to lower secondary education (%)</b> Baseline (2019): 72.2 Target (2035): 94.3 Target (2050): 97	
	<b>15. Percentage of student's enrolment in TVET<sup>3</sup> as proportion of total students (in Basic Education)</b> Baseline (2019): 33.6 Target (2035): 60 Target (2050): 60	
	<b>16. Mean years of schooling (years)</b> Baseline (2020): 4.4 Target (2035): 6.9 Target (2050): 10.9	
	<b>17. Proportion of graduates in STEM related programmes (%)</b> Baseline (2020): 36.9 Target (2035): 44.26 Target (2050): 50	
	<b>18. University young population employment to population ratio (%)</b> Baseline (2020): 56.8 Target (2035): 77.48 Target (2050): 80.18	
	<b>19. Gross domestic expenditure on research and development as percentage of GDP</b> Baseline (2016): 0.66 Target (2035): 1.5 Target (2050): 3	
	<b>20. Percentage of academic staff involved in research publication relevant to socio-economic development</b> Baseline (2020): 23 Target (2035): 38.3 Target (2050): 52	

<sup>2</sup> Lower-secondary education spans grades seven to nine (S1 to S3) in Rwanda. S3 refers to the Junior Secondary School.

<sup>3</sup> Technical and Vocational Training

<b>Comprehensive social safety nets</b>	<b>21. Proportion of population covered by health insurance (%)</b> Baseline (2020): 91 Target (2035): >95 Target (2050): 100	The Government can reach poor, disadvantaged and marginalized farmers and their communities through cold-chain sector as they are the primary stakeholders in the upstream benefiting from the cold-chain services. According to Ministry of Agriculture and Animal Resources (MINAGRI), many of the small farmers in Rwanda are not able to produce a marketable surplus due to limited access to land and require support through social protection programmes (MINAGRI, 2018).
	<b>22. Proportion of poor and vulnerable population covered by social protection systems (%)</b> Baseline (2017/18): 6.5 Target (2035): 20 Target (2050): 50	
	<b>23. Proportion of population accessing social security</b> Baseline (2020): 8.7 Target (2035): 30 Target (2050): 50	
<b>A diversified economy built upon future industries</b>	<b>24. Industry sector's Value-Added contribution to GDP</b> Baseline (2019): 19 Target (2035): 24 Target (2050): 33	Development of clean cold-chain i. will boost the domestic food production, processing, manufacturing industry with new investments and improved productivity. ii. (Along with the development of adequate skill and capacity) could attract equipment manufacturers and facilitate in-country manufacturing of clean technologies.
<b>Modern and innovative Services sectors driving transformative growth</b>	<b>25. Services sector's Value-Added contribution to GDP (%)</b> Baseline (2019): 49 Target (2035): 46 Target (2050): 42	Development of clean cold-chain providing multiple cooling services will benefit multiple sub-sectors within the services sector, for example, food retail and catering with new investments and improved productivity. Technical servicing sector will also benefit, as the clean cold-chain development will have to be supported by in-country development of skilled technicians to ensure proper servicing of the equipment.
<b>Higher investment</b>	<b>26. Investment as percentage of GDP (%)</b> Baseline (2019): 26 Target (2035): 32.6 Target (2050): 35.1	Availability of clean cold-chain will unlock new investment opportunities in the agri-food sector, including production, manufacturing and retail, and de-risk investments ensuring food loss is minimised and high quality and standards are met.
	<b>27. Change in National GHG Emissions (MtCO<sub>2e</sub>) from established Business as Usual (BAU)</b> Baseline (2020): 5.3 MtCO <sub>2e</sub> Target (2035): 16.1 (MtCO <sub>2e</sub> )-BAU; 10 (MtCO <sub>2e</sub> ) - With Intervention Target (2050): 28.2 (MtCO <sub>2e</sub> ) -BAU; 17.5 (MtCO <sub>2e</sub> ) - With Intervention	<i>See point iii under indicator 1. Life expectancy.</i>
<b>Modern and market-oriented agriculture</b>	<b>28. Agriculture sector's value-added contribution to GDP (%)</b> Baseline (2019): 24 Target (2035): 21 Target (2050): 16	<i>See indicator 4. GDP per capita.</i>

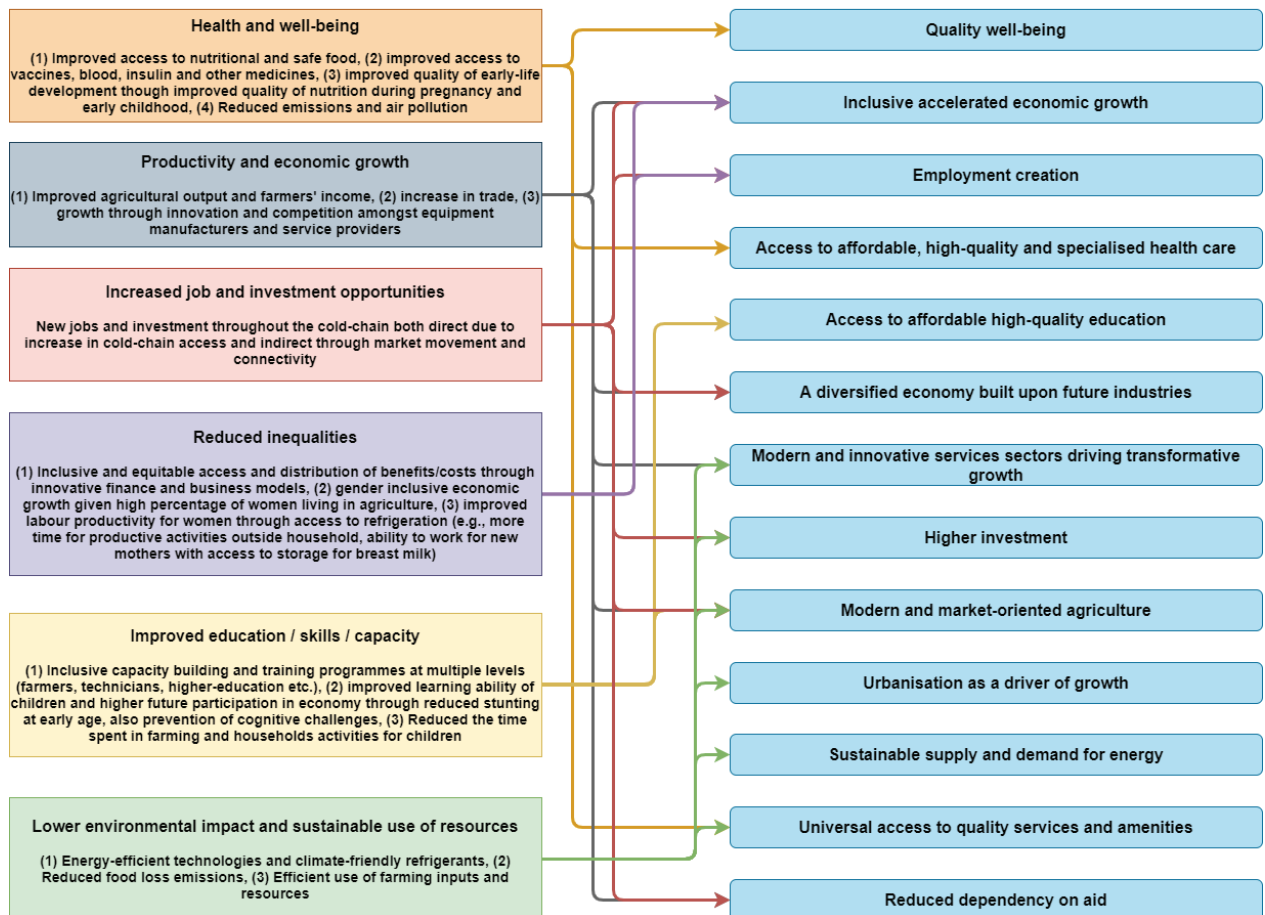
<b>Urbanization as a driver of growth</b>	<b>Population living in urban areas (%)</b> Baseline (2016/17): 18.4 Target (2035): 52.69 Target (2050): 70	<ul style="list-style-type: none"> <li>i. As the urban population increases in Rwanda, connecting local food production in rural areas to urban food demand through clean cold-chain will be critical for ensuring a more resilient food system and sustainable urbanisation.</li> <li>ii. Development of clean cold-chains need to be integrated into urban and rural planning to meet urban populations healthcare needs sustainably and effectively.</li> <li>iii. Space cooling needs can also be integrated into the cooling infrastructure to provide thermal comfort when needed.</li> </ul>
	<b>Proportion of urban population living in slums, informal settlements or inadequate housing</b> Baseline (2016/17): 18.4 Target (2035): 52.69 Target (2050): 70	
	<b>Land used according to the National Land Use and Development Master Plan (km2)</b> Baseline (2020): 10,949 km2 – Agriculture Target (2035): 11,691 km2 – Agriculture Target (2050): 12,433 km2 – Agriculture	<ul style="list-style-type: none"> <li>i. Food loss and waste is responsible for 21% of total land use in Rwanda (WB, 2020c). Access to cold-chain will reduce the food losses and waste which in turn reduces the land use for the same demand.</li> <li>ii. Clean energy infrastructure/technologies deployed along with cold-chain equipment will increase the land productivity, facilitating more efficient use of land.</li> </ul>
	<b>iv. Renewable water resource availability per capita per annum (m<sup>3</sup>/capita/annum)</b> Baseline (2015): 670 Target (2035): 1,000 Target (2050): 1,700	Reducing food loss will improve the resource use efficiency for agricultural inputs, including water used for irrigation.
<b>Affordable and high-quality housing</b>	<b>v. Proportion of rural households settled in integrated planned settlements (%)</b> Baseline (2016/17): 67.2 Target (2035): 100 Target (2050): 100	<i>See objective Urbanization as a driver of growth.</i>
<b>Ease of mobility and efficient transport</b>	<b>vi. Proportion of population conveying with public transportation (%)</b> Baseline (2020): 17 Target (2035): 24 Target (2050): 40	

<b>Sustainable supply and demand for energy</b>	<b>vii. Share of renewable energy in power generation (%)</b> Baseline (2020): 53.78 Target (2035): At least 60 Target (2050): At least 60	The cold-chain development will have to be supported by adequate clean energy infrastructure, such as PV solar micro/mini grids in rural remote areas. In Rwanda, around 50% of population still do not have access to electricity (WB, 2020b), and where there is access, farmers face issues in terms of capacity, affordability, and reliability, limiting the uptake of cold-chain technologies. Clean energy access delivered to power energy efficient and climate friendly cold-chain will also facilitate other productive uses of energy, support uptake and efficient use of agricultural production technologies (e.g., irrigation), and help address other energy needs such as for cooking, lighting, phone charging, internet access etc. Furthermore, with the introduction thermal energy storage systems, cooling generated during off-peak periods can be stored to provide energy access during peak demand periods.
	<b>viii. Access to electricity (%)</b> Baseline (2020): 56 Target (2035): 100 Target (2050): 100	
	<b>ix. Per capita energy consumption (Kwh)</b> Baseline (2019): 50 Target (2035): 1,026 Target (2050): 3,080	
<b>Universal access to quality services and amenities</b>	<b>x. Households using safely managed sanitation services (%)</b> Baseline (2016/17): 86.2 Target (2035): 100 Target (2050): 100	Reduced food losses and access to clean technologies reduce water contamination and improve its quality.
	<b>xi. Percentage of population using improved water source (%)</b> Baseline (2016/17): 87.4 Target (2035): 100 Target (2050): 100	
	<b>xii. Percentage of households with improved water source in dwellings/yard (access to safely managed drinking water services) (%)</b> Baseline (2016/17): 9.4 Target (2035): 55 Target (2050): 99	
	<b>xiii. Population using internet (%)</b> Baseline (2018): 21.77 Target (2035): 60 Target (2050): 88	<i>See objective Sustainable supply and demand for energy.</i>
<b>Enhanced service delivery</b>	<b>xiv. Public services rendered fully online (%)</b> Baseline (2020): 40 Target (2035): 100 Target (2050): 100	

<b>Reduced dependency on aid</b>	<b>xv. Domestic revenues (tax and non-tax) as percentage of GDP</b> Baseline (2018/19): 19.4 Target (2035): 21.5 Target (2050): 21.5	i. Improving market access with the availability of clean cold-chain may help facilitate farm productivity and output that could be taxed through incomes and consumption spending, and also would increase trade which would generate revenue through tariffs and export taxes. ii. Reducing food losses will improve availability of domestic food, thus will reduce the food import bill.
	<b>i. Gross National Savings as percentage of GDP (%)</b> Baseline (2019): 13.2 Target (2035): 22.4 Target (2050): 27.7	
	<b>xvii. Financial sector contribution to GDP (%)</b> Baseline (2020): 2 Target (2035): 5.2 Target (2050): 11.8	The Government's direct involvement as a stakeholder in the cold-chain development could attract financial sector's investment, and the returns from investment will contribute to the GDP.
	<b>xviii. Ratio of the value of investment funds (Total assets) to GDP (%)</b> Baseline (2020): 0 Target (2035): 320 Target (2050): 641	

## Impacts of Clean Cold-Chain

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