



Mongolia's First Cooperative Transformation Attempt on Built Environment through Greening Kindergarten Building

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Design and Technology Option Analysis

Principles:

- Resource efficiency and technology availability locally
- Technology friendliness from both education users and environment perspectives
- Cost effectiveness
- Overall green building principles, including energy efficiency, indoor air quality, comfort ability, use of renewable energy, safety and requirements for outdoor environment
- Encourage local innovation

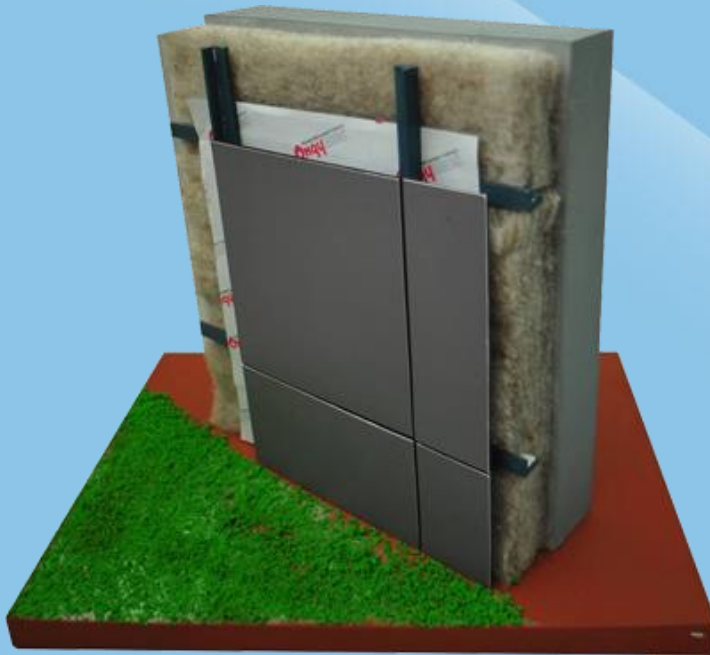


Stakeholder consultation





Building technology options – Example: Insulation





Capacity Building and Cost-Benefits Analysis

Capacity Building

- ❖ Kindergarten users and customers
- ❖ Government
- ❖ Building industries
- Purpose:

Discuss approaches and methodologies of undertaking costs and benefits of analysis with the focus of technology options relate to building structures, heating options, insulation, building exterior and interior which can allow the government working group to make a final decision on technology selection

Cost-Benefit Analysis

Approach and methodology:

The use of quantitative and qualitative indicators

Comparison

The use of financial and non-financial indicators

CBA main Indicators:

Initial investment

Operational and maintenance cost

Heating

Electricity

Fresh water supply and waste water

Treatment

Health, social and environmental impact

Automatic control



Capacity Building and Cost-Benefits Analysis

CBA Results:

- Initial investment is 26% higher than that of similar size ordinary kindergarten building.
- Cost saving includes 50% in heating expenses, 95% in electricity and 16.6% in fresh water supply and 99.5% cost reduction associated wastewater treatment that ensure the prevention of burning at least 68-89 tons of coal annually. In other words, it can reduce the direct CO2 emission by 91.8-120.15 tons a year.
- It can also eventually reduce burden and pressure on state and/or local budgets
- Operational and maintenance cost of a green kindergarten can be twice less costly than ordinary/brown kindergarten. Annual cost saving from the heating provision of 1m2 space is for example 1'449'680 MNT (724SD).
- According to the public health impact analysis of a green kindergarten, annual cost saving per 1 child is 398'571 MNT (199 USD).
- The Net Social Benefits of green kindergarten project is 1.192.2 million MNT as a result of operational and maintenance cost savings, public health and environmental benefits of a green kindergarten building (596000 USD).

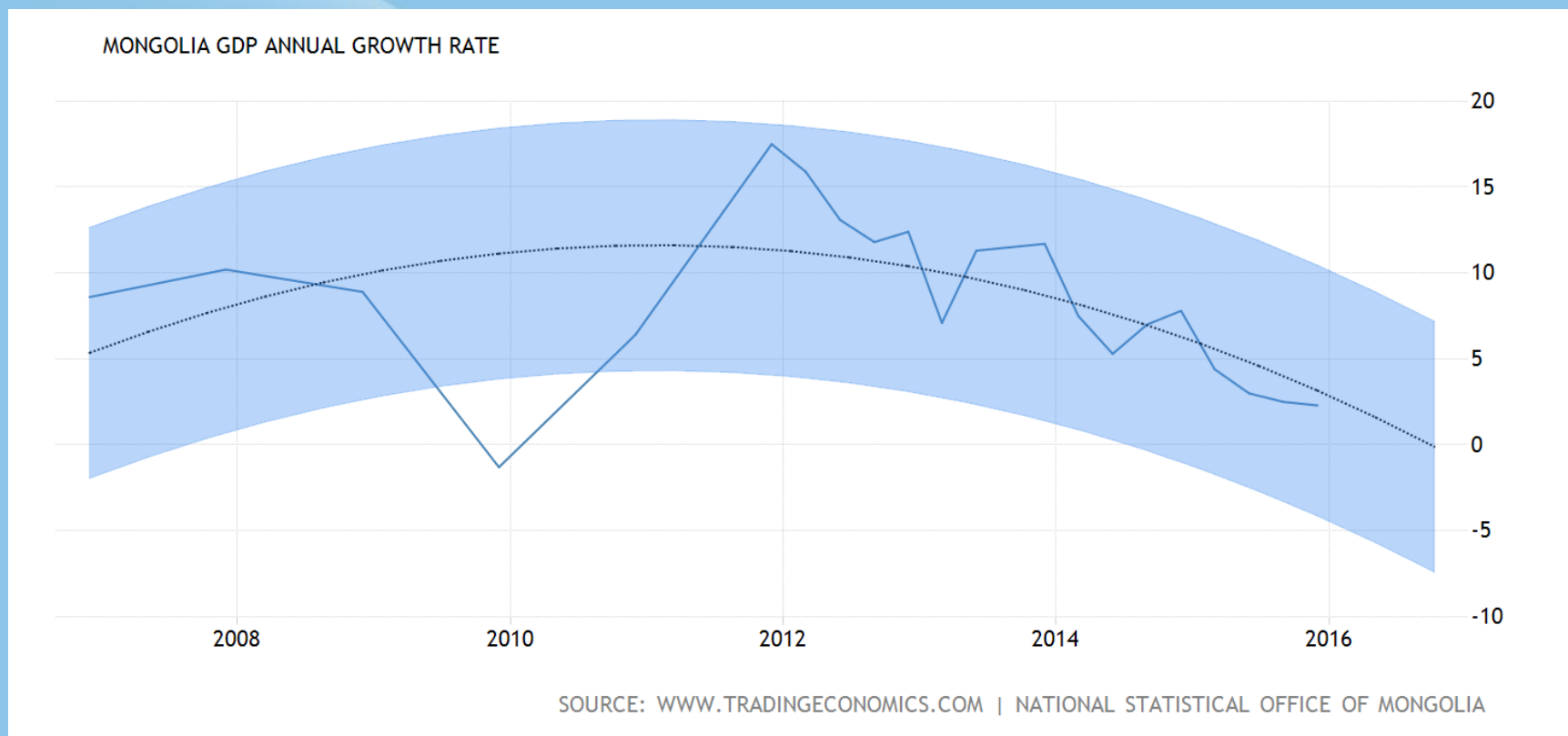


Financing Mechanism Assessment

- Situation analysis
- Identification of potential financing sources
 - State budget
 - Local budget
 - Grant assistance
 - Concessional loans
 - Mixed funding
 - PPPs
 - Private sector funding
 - Special purpose bond
- Assessment of potential financing sources



FMA: Mongolia's economic growth





FMA: Potential funding sources





Assessment of Potential Financing Sources

Potential Financing Sources	Possibility	Expected lead time to prepare and execute a project	Transaction cost	Risk	Ranking 1-most preferred
1 State Budget	1	1	1	4	1
2 Local Budget	2	1	1	4	2
3 Grants from International agencies	2	3	3	1	3
4 Concessional Loan	1	2	3	1	1
5 Mix of Grants and Concessional Loans from International agencies	1	2	3	1	1
6 PPPs-Concession	2	2	4	2	4
7 Private Sector Funding	5	2	2	3	5
8 Special Purpose Bond	3	2	3	2	4



Design Specifics – Final view





Design Specifics – Final view





Design Specifics – Final view





Design Specifics – Final view





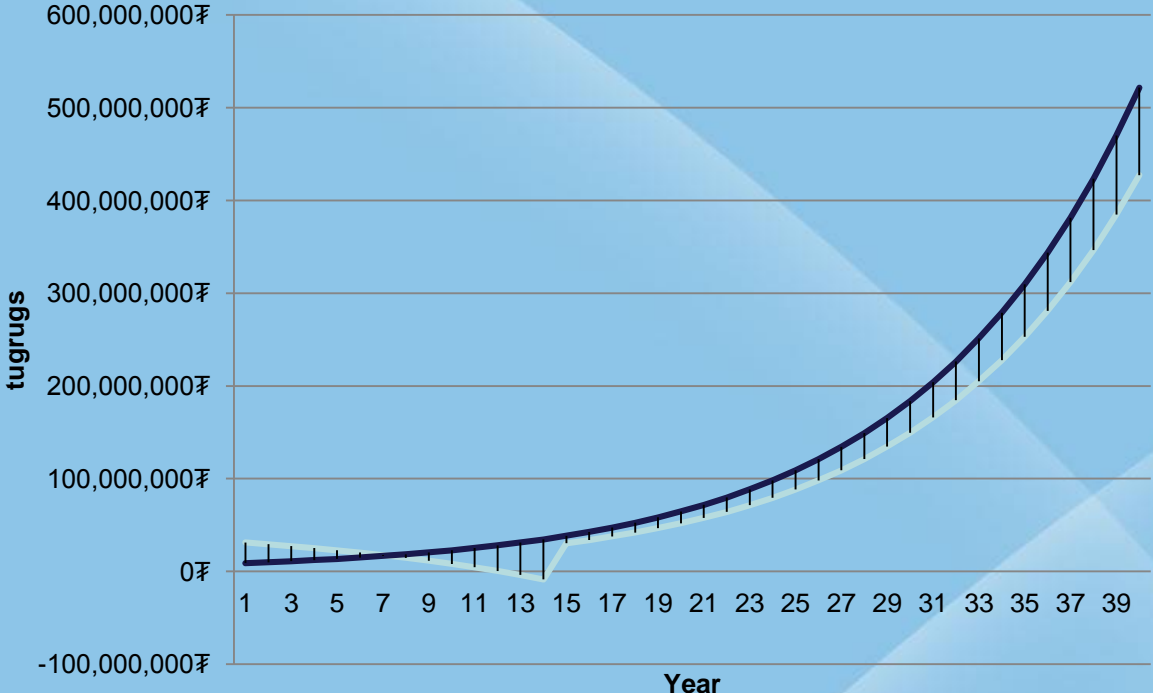
Design Specifics – Final view





Solar panel benefits

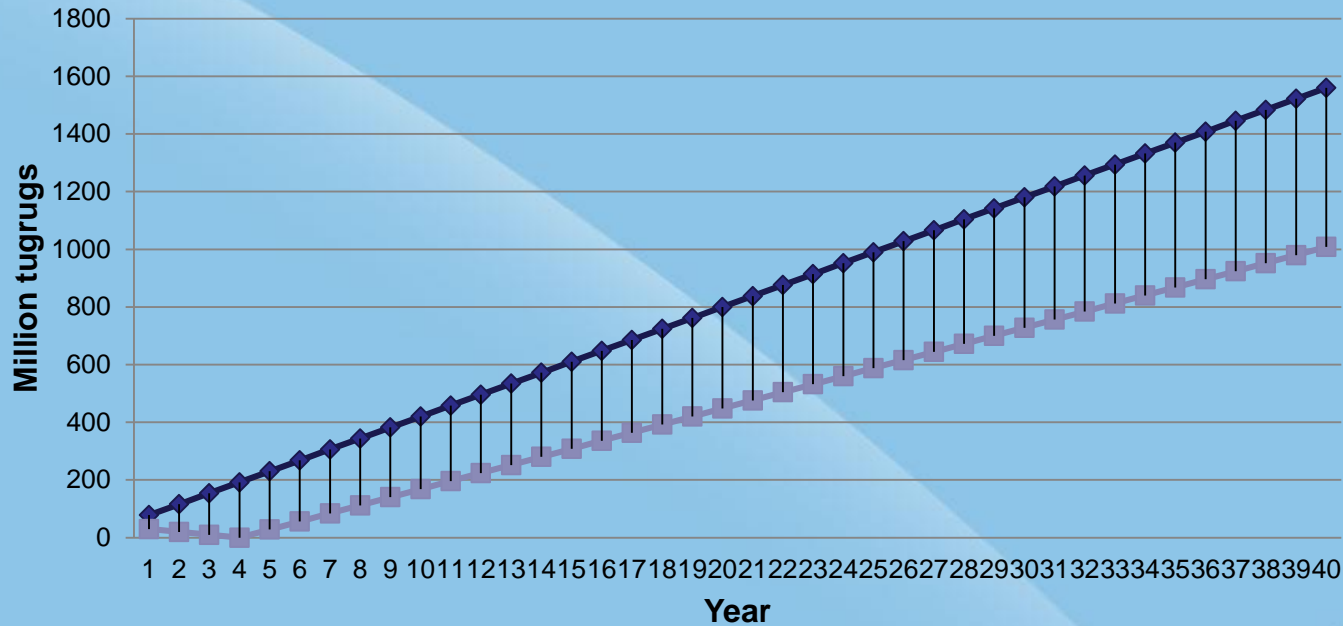
The total savings from green energy use is estimated to be 94.3 million MNT (47000USD).





Heating

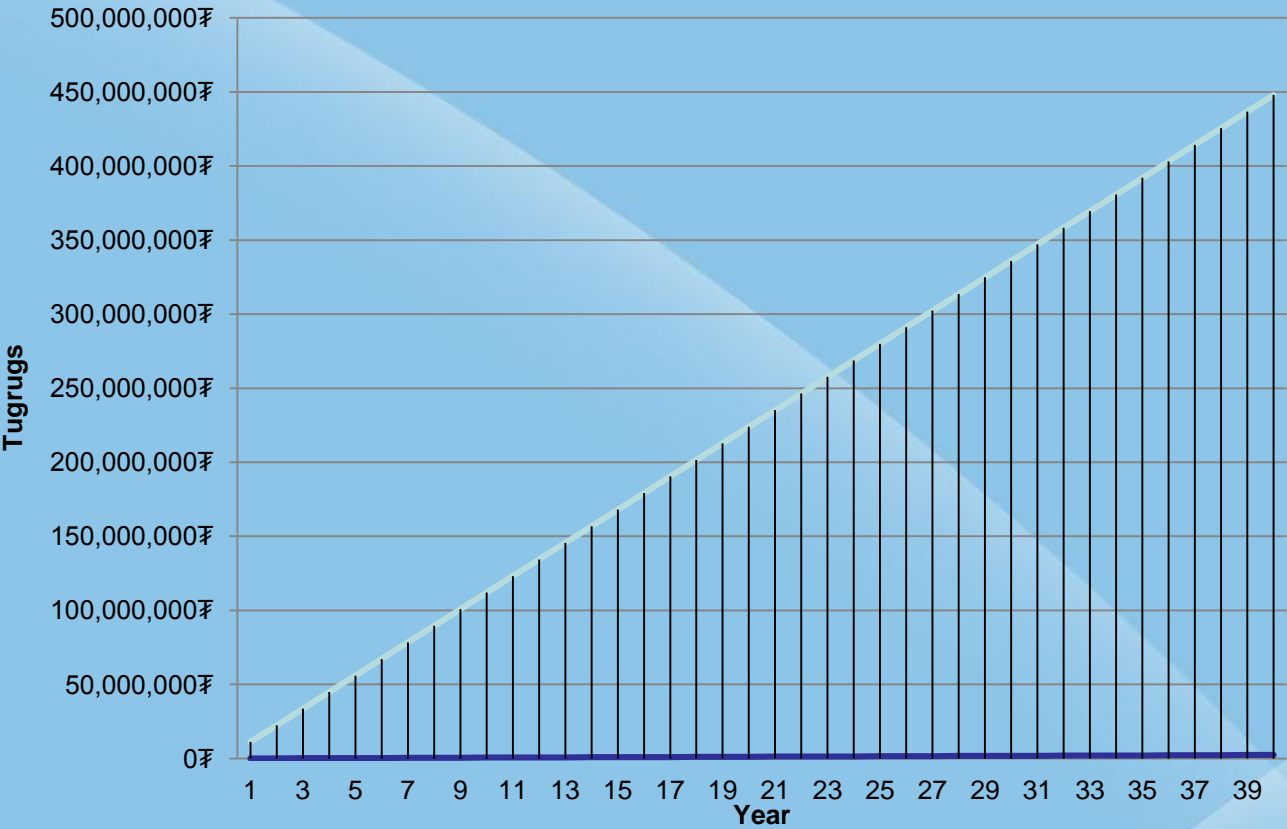
Heating by Electricity



it can ensure 9.1 million MNT (4500USD) savings annually starting from 5th year thereafter.



Sewage



It can ensure 11.1 million MNT (5500 USD) savings annually starting from the second year and thereafter.



Social, Public Health and Environmental impacts

Health conditions	Annually/ MNT	Per child/ MNT
Minimal cost of medicine for treatment of respiratory diseases	11'250'000 (5625 USD)	10'000 (5 USD)
	Minimum labour salary	Per month/ hour
Salaries of parents in 9 months, 125 children	38'571'428.6 (19300 USD)	24
Productivity	100%	100%
Employee satisfaction	100%	100%
Customer satisfaction	100%	100%

Main environmental impact:

- Less air pollution
- Less soil pollution
- Less underground water pollution

Air pollutant	Measuring unit	Air quality	Permitted level
PM-10	ug/m3	157	Minimum pollution /101-250/
PM-2.5	ug/m3	34	Normal /51-100/
PM-1	ug/m3	10	Clean /0-50/
CO	ug/m3	239	Minimum pollution /101-250/
SO 2	ug/m3	11	Normal /51-100/
NO 2	ug/m3	15	Clean /0-50/
NO	ug/m3	3	Clean /0-50/
O 3	ug/m3	76	Normal /51-100/
CO 2	Ton	91.8-120.15	1 ton is valued around \$20 and local valuation is 3.6-4.2million MNT





Possible reuse materials in Green kindergarten building

Euro block

Sheep wool insulation

Gypsum panel

Façade panel

PVC, steel pipes

Rubber studs in playground

Power and communication cables

All kinds of casting



Green engineering design, technology guidelines

The main criteria for green building:

1. Resources efficiency
2. Electricity, heat and water savings
3. Less waste and pollution
4. Use of human and environmentally friendly technology
5. Less operational and maintenance costs
6. Must have innovation elements
7. Eco-friendly environmental planning
8. Using these principles in all phases of planning and construction



Green public procurement

- There is a legal basis for procurement of green kindergarten in Mongolia.
- Bidding documents for green kindergarten was developed based on sample bidding documents of works.
- Technical specification was developed as a part of this Bidding documents
- This can be used for other similar public procurement as an example.



Conclusion

- This assessment and design identified the importance of closer cooperation of relevant stakeholders to successfully run a project and also smooth start of a green building project
- The CBA done from net social benefits perspectives suggested that the green kindergarten project is cost effective and has positive net social benefits with twice reduced operational and maintenance costs and is resource and energy efficient.
- The state budget, concessional loans and a mixed funding of grants and concessional loans from international agencies are most preferred funding sources for construction of green kindergarten building.



Conclusion

- The final design of green kindergarten building meets all required standards and building code of Mongolia and the building is designed to be child and environmentally friendly.
- Any public procurement shall be organized in line with public procurement procedures and regulation. The technical specification is an important part of the bidding document of the procurement. Therefore, the project team developed the model technical specification for green kindergarten based on the selected technologies and building materials which can be used as it is or can be slightly modified depending on specific local conditions and requirements



THANK YOU!