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Problem of the Use of Polluting Energies on Global Warming, Case of Charcoal (Embers) in Households and Fuel oil in the Community Transport System in the City-Province of Kinshasa

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Abstract:- In order to assess the effects due to the use of polluting energies on global warming, a study was carried out in the city province of Kinshasa from March 15 to June 15, 2018 to identify the various causes of the use of charcoal in households and fuel oil in the automobile transport system in order to analyze the adverse environmental effects resulting from the use of this fossil fuel. A quantitative and qualitative field survey of 100 questionnaires were carried out on a random sample in the city of Kinshasa province, these data were processed and analyzed with Statistix and Excel 2010 software. After surveys, it appears that the solutions favored by our scrutinized, solar and the improvement of hydroelectricity to 22 and 50%, ie the majority; Wind energy at almost 3% and in last position, fossil energy at 25% most in the community transport network. All of these solutions are most closely related to the daily purchasing power of the people of Kinshasa. This article analyzes the constraints linked to the use of charcoal and fuel oil, to study a non-polluting system that can serve the city of Kinshasa based on the proposals made by the community under study, to develop a project of sustainable development to solve the energy problem in this environment.

Keywords:- Biodiversity, Greenhouse Gases, Charcoal (embers), Global Warming, National Electricity Company (SNEL).

I. INTRODUCTION

Nowadays, humans use fossil fuels with release of enormous quantities of greenhouse gases (GHG) to meet the energy needs and which are the basis of climatic variations. Africa is full of renewable energy potential in large quantities, but the majority of African countries rely on fossil fuels, especially charcoal, which causes deforestation.

The Democratic Republic of Congo is no exception to the rule because the consumption of fossil fuels is far greater than that of non-polluting. The case of charcoal justified by low hydroelectric consumption, the only clean national energy source and each part of the country seeks to resolve this energy crisis according to it.

The city of Kinshasa, which is experiencing a high demographic growth rate (5%) whose population is estimated at nearly 10 million inhabitants in 2014, and is projected to be between 14 and 17 million in 2030, this deficit in electrical energy makes users resort to the use of charcoal, which especially in the suburbs of the city. This use of charcoal leads to deforestation, thus destroying the environment. In the meantime, in the transport network in Kinshasa, car users prefer to use the diesel engine to consume fuel oil, for a reduced supply cost and the slower consumption of this liquid. This fuel oil, which is one of the pollutants that emit enough Greenhouse gases.

The present study stands out by the fact that it analyzes not only the damage to the use of polluting community energies at the financial or economic level of the population and in terms of global warming but also and above all offers a solution as to the energy use by non-polluting ones. As a result, you should ask yourself the questions opposite:

- Why the excessive use of fuel oil in the transport chain in the city of Kinshasa and the exploitation of charcoal in the household network? ;
- What is the environmental and economic impact of the use of fuel oil and charcoal in the city and its surroundings? ;
- What to do to reduce the constraints linked to these uses on the environment. ?

II. MATERIELS ET METHODS

All scientific research must be done through methods and techniques. We have proposed methods and techniques which are:

II.1 *Methods*

To carry out our survey, we used methods such as:

- Comparative Method: It allowed us to compare different energy sources to find a better, less expensive and non-polluting one.
- Genetic Method: Determine the origins of the use of charcoal (Ember) as well as the use of Oil, fuel for cars.
- Dialectical Method: Making the shock between non-polluting energies and polluting ones

II.2 *Techniques*

We used two kinds of techniques:

Investigation techniques

- Questionnaire: this one helped us to collect data on the basis of a series of questions proposed to the interviewee. We dropped 100 questionnaires on the basis of our random sample.
- The interview: in addition to the language, with some respondents, we have the interview in order to realize the veracity of the data.
- Observation: this put us in contact with our study environment to identify other collateral facts to our study.

Analysis Techniques

Here it is for the interpretation of the data collected:

- Sampling: was chosen in a simple random way and we took 100 respondents.
- Statistics: to represent our results in figures. - Graph: allowed us to classify our results in graphs or diagrams.

II.3 *Environmental studies*

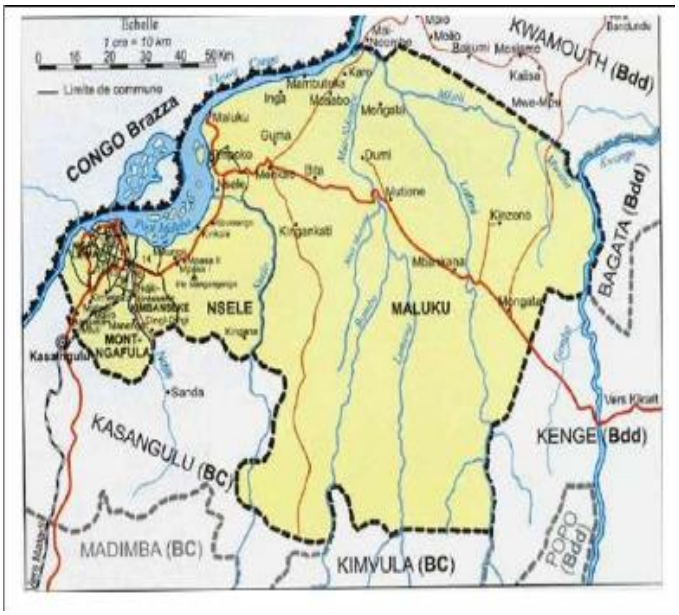

Fig 1 : Kinshasa Administrative Map

II.3.1 *Geographic location.*

The city of Kinshasa is located between latitudes 4 ° and 5 ° and between east longitudes 15 ° and 16 ° 32, it covers an area of 9,965 km2, along the southern shore of the "Pool Malebo" and constitutes a huge crescent covering a low flat surface with an average altitude of about 300 m. It is limited to the east by the provinces of Mai-Ndombe, Kwilu and Kwango; to the West and North by the Congo River which is the natural border with the Republic of Congo Brazzaville; in the south by the province of Kongo Central [9].

II.3.2 *Relief*

Kinshasa is a city with a discordant topography by its plain and its hills. This city has a marshy and alluvial plain whose altitude varies between 275 and 300 m, but also a region of hills with an altitude of 310 to 370 m made up of the Ngaliema and Amba mountains as well as the Kimwenza and Binza plateaus. . In general, Kinshasa is characterized by four main details:

- Malebo Pool, a lake boom dotted with islands and islets extending over the river bed between Kinshasa and Brazzaville, thus extending over more than 35 km with a maximum width of 25 km;
- Plain of Kinshasa, a more urbanizable area, little erosion, however liable to a serious problem resulting from poor water drainage. This plain extends over nearly 20,000 hectares with low sandy alluvial masses located between 260 and 225 m above sea level, penetrating to a depth of nearly 10 km on average [4]. The plain of Kinshasa would have the shape of an amphitheater;
- Terrace, a set of low ridges surmounting the plain from 10 to 25 m. This terrace is a stony deposit of soft sandstone blocks mixed with sandstone with silica covering yellow clay with brown silt.
- The Hill Zone for a few km from Malebo Pool. In this area, normal phenomena such as sheet runoff or the evolution of circuses by regressive erosion are accentuated by human activity. They then take on a catastrophic appearance. If in the East, we can consider some of them as witness mounds of the Batéké shelf in the West and in the South, in the West as in the South, nothing clearly indicates their origin. They extend over a very great depth and peak at over 700 m. They are rounded with soft shapes, shaped and modeled by the local rivers which hollow out numerous valley heads in the shape of circuses.

II.3.2 *Climate, soil and Vegetation*

The city of Kinshasa has a hot and humid tropical climate, with an average annual temperature of 25 ° C and an average annual rainfall of 1,400 mm. The relative humidity of the air has an overall average of 79%. It rains in Kinshasa for an average of 112 days a year with a peak of 18 days of rain in April. The city has two seasons: a rainy season and a dry season [12]. The rainy season runs from mid-September to mid-May, with peaks of heavy rainfall in the months of November and April. The relatively short dry season covers the period from mid-May to mid-September.

Kinshasa's soil is of the Arénoferrasol type, made up of fine sands with a clay content generally less than 20%, characterized by a low organic matter content and a low degree of saturation of the absorbent complex [12]. And according to Pain, the sub - Kinshasa soil is characterized by Precambrian bedrock which includes finely stratified and often feldspathic red sandstone rocks [11]. It constitutes the upper part of the Schistogresous system and outcrops at the level of the rapids at the foot of Mount Ngaliema and to the south of the N'djili river . The Kinshasa region is home to forest, grass, ruderal and aquatic vegetation.

II.3.3 *Hydrography*

The hydrographic network of the city of Kinshasa includes the Congo River and its main tributaries on the left bank which, for the most part, cross the city from South to North. These are mainly the Lukunga, N'djili, N'sele, Mai-Ndombe and Mbale rivers [4]. These rivers are currently polluted due to the lack of adequate sanitation and the city's demographic pressure. Rivers such as N'djili, N'sele, Gombe, Funa, Basoko and Ndolo which flow into the river, play an important role in the transfer and supply of the city. The hydrographic basins are: Lubudi, Binza, Mampunza, Makelekele, Yolo, Matete, Bandalungua, Tshangu, Kalamu and tshenke which have seasonally varying flows.

II.3.4 *Electricity*

Energetically, the city of Kinshasa secures the hydroelectric power stations of Inga and Zongo of Kongo-Central for its supply of electric energy. Given that the amount of energy for the city of Kinshasa is still insufficient, this is the reason for the use of charcoal in Kinshasa households [4].

III. RESULTS AND PRESENTATIONS

If energy is not a scarce commodity in Kinshasa, it is far from being of a permanent preponderance, because the energy need of the city of Kinshasa is not met in the right way, especially in the outskirts of the city. . The causes are to be found mainly in the technical part and the maintenance of the installations of the National Electricity Company (SNEL), but also in the demographic and spatial growth of the city.

The significant presence of oil-powered automobiles is mainly due to the desire to earn more than the use of an unleaded gasoline engine would be nearly impossible in the public transport system of Kinshasa's life.

III.1 Presentation of the survey

In this part, we briefly discuss the results of our investigations related to the problem of the use of polluting energies on global warming, the case of charcoal in households and fuel oil in the automobile transport system in the City-Province of Kinshasa.

III.2 *Goals of the Survey*

The objectives that we offer to this investigation are:

- Identify the various causes of the use of charcoal in households and fuel oil in the automobile transport system in the City-Province of Kinshasa.
- Analyze the adverse environmental effects resulting from the use of this fossil fuel.
- Collect from the respondents, the various possible solutions proposed and prioritize them, to identify a more global and oil-stain in the next chapter

III.3 *Results analysis*

SECTION 1. Identify of investigators

Question	Responses	Frequencies	%
How old are you	From 0 to 25	11	9,2
	From 25 to 35	60	50
	From 35 to 50	42	35
	50 years old	7	5,8
	Total	**120**	**100**

Table N°1 : Age distribution

Comment: Out of 120 scrutinized, 11 at the age which varies between 0 and 25 years old, 60 are between 25 and 35 years old, from 35 to 50 years old to 42, and 50 years old are at almost 7.

Question	Responses	Frequencies	%
What is your gender?	Male	63	52,5
	Fémale	57	47,5
	Total	**120**	**100**

Table N°2 : Breakdown by Gender

Comment: Parity here in our investigations is more or less respected with nearly 52% of men for the most part, car users and 47% of women, mostly housewives.

Question	Responses	Frequencies	%
What is your marital status?	Married	45	37,5
	Single	70	58,3
	Divorced	-	-
	Widower	5	4,2
	Total	**120**	**100**

Table N°3: Civil status of the investigated

Comment: From our investigations, we were able to scrutinize the married to nearly 37% of our sample, while 58% single and 4% of this sample widowed.

Question	Responses	Frequencies	%
What is your education level?	Primary	19	15,8
	Secondary	48	40
	University	36	30
	Professional	12	10
	No	5	4,2
	Total	**120**	**100**

Table N°4: Level of study

Comment: The level of study of our scrutinized in this table n° 4 is 16% of primary education, 40% have been in secondary school, 30% have been able to do higher studies, 10% have practiced training professional and 4% have never studied.

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SECTION 2. Questions themselves

Question	Responses	Frequencies	%
Are you connected to SNEL?	Yes	91	91
	No	9	9
	Total	**100**	**100**

Table N°5: Membership of SNEL

Comment: In this table, it is clear that most of them are connected to the SNEL network. The sample shows that a very small part of the city is not connected to this energy network.

Question	Responses	Frequencies	%
Do you have an automobile?	Yes	20	20
	No	-	-
	Total	**20**	**100**

Table N°6 : Have an Automobile

Comment: It appears that our entire sample is a member of an automobile in the community transport system.

Question	Responses	Frequencies	%
What type of engine do you have on your automobile?	Petrol engine	11	55
	Diesel Engine (Fuel Oil)	9	45
	Total	**20**	**100**

Table N°7 : Engine Type Used

Comment: 55% of our sample uses the gasoline engine while the other 45 prefer the oil engine.

Question	Responses	Frequencies	%
Why did you use embers to solve the energy problem?	Because of the load shedding	42	42
	For lack of electric household appliance	8	8
	Unexpected cuts	35	35
	Others	15	15
	Total	**100**	**100**

Table N°8: Rationale for using charcoal (Ember)

Comment: 42% of those surveyed give reason for load shedding for the use of charcoal, 8% lack of household appliances, 35% because of untimely cuts and the other 15 have their particular reason.

Question	Responses	Frequencies	%
What is the liquid quantity of embers consumed in your household per day?	1000 Francs Congolais	45	45
	2000 Francs Congolais	35	35
	3000 Francs Congolais et Plus	20	20
	Total	**100**	**100**

Table N°9: Quantity in liquid per day of the embers consumed by the household

Comment: This table says that 45% consumes nearly 1000 Congolese francs of Makala per day, 35% claims 2000 Congolese francs and 20% spends 3000 Congolese francs.

Question	Responses	Frequencies	%
How much do you contribute the month for the embers in your household?	Nearly15$	38	38
	Nearly 20$	33	33
	Nearly 30$	17	17
	50$ and plus	12	12
	Total	**100**	**100**

Table N°10: The Cost of the Charcoal Monthly Contribution (Ember)

Comment: 38% of our sample spends almost $ 15 monthly; 33% contribute at least $ 20 and 17% pay more than $ 30 per month; finally, 12% (mainly makeshift restaurants) even spend more than $ 50 per month

Question	Responses	Frequencies	%
Why did you use the fuel oil engine to solve the energy problem?	For more savings	2	10
	Due to the type of engine used	8	40
	Other reasons	10	50
	Total	**20**	**100**

Table N°11: Justification for the use of an automotive fuel oil engine

Comment: It appears that 10% chose the oil engine for economic reasons, 40% because of the type of engine used particularly for the endurance of this type of engine and 50% for other reasons.

Question	Responses	Frequencies	%
How much fuel does your automobile consume per day?	10 liters	-	-
	15 liters	1	10
	20 liters	2	20
	20 liters and Plus	7	70
	Total	**10**	**100**

TableN°12: Quantity of fuel oil consumed by the automobile

Comment: Table 12 indicates that nearly 10% consumes 15 to 20 Liters of fuel oil during the day (mainly Mercedes 207 type vehicles), 20% states 20 liters and 70% consumes more than 20 liters per day (say 40 even 50 liters during the day, and there are also vehicles such as trailers that can supply up to nearly 200 liters per day during the day.

Question	Responses	Frequencies	%
How much unleaded gasoline does your car use per day?	5 liters	-	-
	10 liters	2	20
	15 liters	3	30
	20 liters and Plus	50	50
	Total	**10**	**100**

Table N°13: Amount of Gasoline consumed by the automobile

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Comment: It emerges from this table that 20% of our surveyed (mainly the so-called personal vehicles) consume ± 10 liters of gasoline per day, 30% affirms 15 liters and 50% consumes more than 20 liters during the day mainly the so-called Taxi buses Ketch and Hiace.

Question	Responses	Frequencies	%
How much do you contribute the month for Heating oil?	Nearly 500$	1	10
	Nearly 800$	2	20
	Nearly 1200$	5	50
	Nearly 1500$ or Plus	2	20
	Total	**10**	**100**

Table N°14: Cost of the Monthly Fuel Oil Contribution

Comment: 10% of our sample spends $ 500 per month; 20% contributes with $ 800 and 70% pay more than $ 1200 per month mainly for public transport buses such as Hiace, Mercedes 207, Heavy Duty (Ben…) which transports sand and others.

Question	Responses	Frequencies	%
How much do you contribute the month for gasoline?	Nearly 200$	-	-
	Nearly 400$	2	20
	Nearly 600$	5	50
	Nearly 1000$ or Plus	3	30
	Total	**10**	**100**

TableN°15: Cost of the Monthly Unleaded Gasoline Contribution

Comment: 20% of our sample spends up to $ 400 per month on fuel (mainly personal vehicles); 50% contribute up to $ 800 (muni-taxis like Ketch) and 30% pay more than $ 1000 a month (especially American type school buses and others ...).

Question	Responses	Frequencies	%
What are the consequences of using Embers and Fuel Oil Engines?	Acid rains	5	4
	Air pollution	12	10
	Déforestation	40	33
	GHG emission	23	20
	Others	40	33
	Total	**120**	**100**

Table N°16: Consequences of Embers and Oil Engine

Comment: From our surveys, it emerges that 10% of our sample affirmed that fuel oil engines pollute the air, 33% supported the destruction of forests by making embers, 20% attested to GHG emissions from fuel oil combustion, 4% said that acid rain would also be among the consequences of fuel oil combustion and 33% are classified as other consequences such as problems related to breathing, skin color change and others.

Question	Responses	Frequencies	%
Are you ready to welcome a new source of energy?	Yes	106	89
	No	14	11
	Total	**120**	**100**

Table N°17: Readiness for an energy innovation

Comment: Our sample mostly showed the will to adhere to an energy innovation to nearly 90% of respondents and 10 others did not support the idea with specific assessments.

Question	Réponses	Fréquences	%
What is the condition ?	Less expensive	65	54
	Less polluting	30	25
	Durability	15	12
	Others	10	9
	Total	**120**	**100**

Tableau N°18 : Les conditions d'adhésion à l'innovation

Comment: The observation is that our sample requires conditions which are 80% less expensive, 25% less polluting, 12% sustainable and 9% precise other conditions which would be more linked to political will in energy matters.

Question	Responses	Frequencies	%
What is the sustainable solution to the energy problem?	Wind turbine	3	2,5
	Solar	26	22
	Hydroélectricity	60	50
	Fossil	16	13
	Unleaded petrol	15	12,5
	Others	-	-
	Total	**120**	**100**

Table N°19: Pathways to energy solutions

Comment: From this table, it is visible that 2.5% have chosen wind power, 22% have opted for solar power, 50% for hydroelectric power and 13% have opted for fossil energy under lesser conditions. Polluting; 12.5% think they will continue with the use of gasoline.

III.4. Presentation of the results

III.4.1 *Causes of Using Wood Energy and Oil Engine*

Our survey suggests that 42% of the use of charcoal (Ember) in the various households of the City of Kinshasa is due to recurrent power cuts in the SNEL electricity network; a negligible proportion due to a lack of household appliances; 35% because of untimely power cuts to SNEL; and a good part of the city would claim the overbilling of the SNEL that is to say, the high cost of the bill of the SNEL mainly the households which are not connected to the meter of the SNEL and undergo the flat rate billing.

However, in the automobile transport system in Kinshasa, the observation is that, the main causes of the recourse to the oil engine is at 10% due to the too expensive economic spring and at 40% to the types of engine (of the designer) used by the automobile users but also the high cost of a liter of gasoline compared to that of fuel oil.

III.4.2 *Daily Quantity of Embers and Fuel Oil per Engine*

Most households in Kinshasa use an average of 2,000 Congolese francs a day, to stock up on energy from the embers for sufficient food preparation in a house. In addition, we noted a weak preference for the Gasoline engine for motorists, even if this one is the most used than the Diesel engine with Fuel oil at 55% in taxi (car), taxi-motorcycle and personal automobile. Cars that use fuel oil stock up to 30 liters on average during the day, while gasoline engine users spend up to 50 liters on average during the day, and even at the station, a liter of gasoline is more expensive than fuel oil.

III.4.1 *Consequences of Charcoal (Ember) and Fuel Oil*

The observation is that, nearly 10% of our respondents find that air pollution is the main consequence of the oil engine, 4% find damage by microparticles such as acid rain; 33% think that the accumulated deforestation to make the embers, leaves exposed by pollution, the atmosphere; 20% maintain that the GHGs from the City's industries as well as the smoke repressed by the combustion of fuel oil in cars, infect especially the market gardening crops seen on the roadsides in the City such as the market gardening towards SAYO in Kasa-Vubu and that of N'SELE to name but a few. 33% suggest that the use of embers is also the cause of the epidermal modification.

All these energies report certain problems related to breathing and ophthalmology due to the release of small particles in the air by the combustion of these fossils.

III.4.3 *Monthly Contribution Costs*

From the energy potentials that Kinshasa abounds, we can say that energy users spend more in relation to their income and purchasing power. There are households that manage to consume up to nearly $ 30 a month. The case of over $ 50 spent at Makala is often seen in makeshift restaurants.

However, 38% of households in our survey consume almost $ 15 per month, nearly 15% even exceed the $ 20 or $ 30 per month bar. In addition, the gasoline expenditure is more significant in taxis, taxi-motorcycles and personal automobiles, and even in American-type vehicles which have a gasoline engine such as the School-Bus of Color Yellow, GMC, Ford and other. $ 200 to $ 600 in fuel expenses for personal automobiles per month found in our investigations.

Meanwhile, mini-taxis, taxis, taxi-buses and other gasoline-powered trucks consume almost $ 1,000 or more elsewhere per month. These expenses lead some motorists to adapt the diesel engine in their vehicles since it, according to the observation of these motorists, would be more economical, durable but only, this engine does not have a very good transmission while you are driving by compared to a gasoline engine. Indeed, European type automobiles which include the diesel engine are best preferred by public transport motorists in Kinshasa for economic reasons. If we take the example of the Mercedes 207 in Kinshasa, consumes up to 30 liters per day.

The same gasoline consumption would cost 0.2 times more. And those expenses range from $ 800 to $ 1,500 a month for the diesel engine. A peculiarity also in heavy goods such as trailers which would already spend nearly 200 liters per day. For a month, these vehicles spend 5 to 10 times more than the Mercedes 207 and other Taxi-buses in the community transport system in Kinshasa.

IV. CONCLUSION

Electricity is a fundamental element in economic development and its consumption is one of the parameters that best reflects the evolution of a country's economic activity. The Congolese energy sector still needs to progress a lot to meet the needs of its population, in particular the poor in urban-rural areas. Progress is slow due to a number of factors, including: low investment (insufficiently exploited energy potential as well as underdeveloped energy transport infrastructure and network); inefficient management and planning resulting in poor financial performance in the energy sector; an inadequate institutional framework, including policies and regulations that prevent greater private sector participation; and limited technical capacities which lead to premature failure of existing equipment.

Despite the existence in the DRC, particularly in the city of Kinshasa, of a very large reservoir of energy resources, especially hydroelectric resources which, in absolute terms, are still underexploited. The DRC is ranked 168th out of 177 countries examined, according to the human development index established by the United Nations system, less than 7% of the Congolese population has access to electricity.

In households, the consequences of using charcoal, such as deforestation and others, are nevertheless known. But, it is more a question of the insufficient electricity of the SNEL which would be the basis of the use of embers. Overbilling, untimely cuts and load shedding are among the causes of use of Makala in households in Kinshasa. Kinshasa itself can produce enough energy to consume locally and sell. Of this potential, it would be a paradise if the administrators and the population adhere to a policy of improving the standard of living.

Excessive use of fossil fuels, such as coal and petroleum, produces far too much gas. These gases are a cause of the increase in the greenhouse effect, creating global warming. In addition, these energies serve us on a daily basis, as if to move around. To reduce our CO2 emissions, it would however be possible to have a clear and predictable policy, with an objective, criteria, a method and coherent actions; the goal being to consume less fossil energy (fuel oil) to reduce our emissions, of course, but only if we reduce uncertainty and give ourselves the financial means; gradually raise the cost of fossil energy by setting a floor price for fuel oil, gas and fuel oil for final consumption.

From our investigations, it is said that, the economic spring would be a major problem on the good use of energy resources in the City of Kinshasa. These users, especially those who use fuel oil for energy, lead us to believe that they are often not informed of the constraints of these fossils.
The use of hydroelectric and solar energies are perhaps the most effective means to fight against climate calamities. The adequate development of the existing potential by the rehabilitation of the productive equipment in place, the erection of new hydroelectric infrastructures, and the reinforcement of the existing transmission lines will make it possible to significantly increase the rate of access of the Kinshasa population to electricity. electricity and thus participate in improving the standard of living. Hydroelectric power stations have a well-developed micro-power plant technology, making it possible to make hydroelectric power, the best controlled of all renewable energies. Its equipment has a reliable warranty and a long service life. Hydraulic energy is clean since it does not directly generate any harmful emissions both for the planet and for man.

The installation of solar panels is also a simple and efficient way to produce energy while protecting the atmosphere from any source of pollution. Of course, this transformation system is inexhaustible. It should also be added that its use is becoming more and more common in Kinshasa (Orange-Energie, etc.). It is one of the only energies to compete with non-renewable energies.

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