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STUDIES ON PRIORITIZATION AND ECONOMIC EVALUATION OF CLIMATE CHANGE ADAPTATION OPTIONS FOR THE HEALTH SECTOR IN CÔTE D'IVOIRE

ADIKO ADIKO FRANCIS

Health Sociology Researcher, Centre Ivoirien de Recherches Economiques et Sociales (CIRES), Université Félix Houphouët-Boigny, 08 B P 1295 Abidjan,
Tel: +225 07 08 02 89 45,

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ABSTRACT

Faced with climate change, the Ivorian health system remains particularly vulnerable to climate-sensitive diseases (malaria, acute respiratory infections, diarrheal diseases). This study aims to quantitatively assess the costs and benefits of adaptation measures to guide policy decisions. The mixed methodology approach combines exhaustive literature review, field missions in six strategies localities, and institutional consultations. The results reveal that priority adaptation options represent 46.1 billion FCFA annually: resilient water infrastructure (26.9 billion), epidemiological surveillance committees (17.3 billion), and population awareness (1.9 billion). In contrast, non-adaptation costs total 222.1 billion FCFA annually, distributed among curative services (117.2 billion), lives lost (68.6 billion), and productivity losses (36.3 billion). Thus, non-adaptation costs far exceed preventive measures, confirming the profitability of the proactive approach. Ultimately, this assessment demonstrates that investment in health adaptation constitutes an economically rational strategy for a resilient health system.

Keywords: Climate adaptation, Economic assessment, Climate-sensitive diseases, Resilient health system

1.0 INTRODUCTION

1.1 Context

Climate change represents one of the major challenges for health systems today, particularly in developing countries where adaptive capacity remains limited. In its 7th edition of the Economic Situation Report, the World Bank (2018) ranks Côte d'Ivoire as a country particularly threatened by the impacts of climate change. Indeed, the health impacts of climate change are manifested through the increase in the prevalence of climate-sensitive diseases such as malaria, acute respiratory infections (ARIs), and diarrheal diseases.

At the regional level, the country faces major health challenges exacerbated by climate variability, which affects its four climatic zones differently. This regionally diverse health situation reveals the urgent need for an approach adapted to territorial specificities. Thus, in the attenuated equatorial transition zone, the regions of Dimbokro and Taabo perfectly illustrate this problem. In Dimbokro , the upward trend in temperature has increased since the 1980s, exceeding 26.8°C on average (Kouassi et al., 2010), leading to a deterioration in living

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conditions and high vulnerability to diarrheal diseases (Kouamé et al., 2022; Koné et al., 2014; Dongo et al., 2008). The unavailability of hydrological resources, with 20.57% of boreholes non-operational (Fossou et al., 2020; N'Guessan et al., 2015), aggravates this situation. In Taabo, the construction of the hydroelectric dam has also created an environment conducive to neglected tropical parasitic diseases, with 26 cases of onchocerciasis recorded in 2016 (MSHP, 2017). The Baoulean zone of Bouaké is distinguished by a strong influence of hydrometry on malaria risk with 76.6% accentuation (Kanga et al., 2021), despite a moderate general vulnerability (Kouamé et al., 2022; Koné et al., 2014; Dongo et al., 2008). To the north, the Sudanese zone is experiencing critical challenges with thermal increases exceeding 3°C (SODEXAM, 2021). This situation generates specific pathologies: severe acute malnutrition (7.8%) and cerebrospinal meningitis in Korhogo (RCI, 2014; N'Krumah et al., 2014), high vulnerability to diarrheal diseases in Odienné (Kouamé et al., 2022; Koné et al., 2014; Dongo et al., 2008). The mountainous region of Man, characterized by significant rainfall (up to 2300 mm in Danané), favors various pathologies whose evolution correlates significantly with climate variability, as demonstrated by the comparative analysis of 1996-2000 (RCI, 2010). Geographic disparities are a particularly worrying obstacle, with a disproportionate concentration of human resources in the southern regions, particularly in Abidjan, creating a critical imbalance in the provision of services across the national territory. This unequal distribution, combined with insufficient medical personnel and epidemiological alert systems, significantly limits the ability to anticipate and respond to climate-related diseases. Furthermore, the lack of knowledge about the links between climate change and health represents a major obstacle to the development of relevant adaptation strategies. These regional epidemiological disparities, combined with unfavorable climate projections for 2050, underscore the urgent need to economically assess adaptation options to direct public investments towards effective and territorially adapted health interventions. Faced with this situation, the economic assessment of climate adaptation strategies in the Ivorian health sector is becoming crucial to guide public policies and optimize the allocation of limited resources.

In Côte d'Ivoire, the costs proposed in the revised NDCs are estimated by the National Health Sector Adaptation Program. These costs of health adaptation actions to climate change integrate priority adaptation measures and financing needs that were to be financed by the WHO and estimated at USD 16.95 billion. However, it is estimated that the needs could be revised upwards. For comparison, the World Bank's multisectoral child nutrition and development project in Côte d'Ivoire was estimated at USD 60.4 million. However, several obstacles hinder the success of adaptation actions in the Ivorian health sector. These challenges include the lack of institutional memory due to data archiving problems, the low proportion of the state budget allocated to the health sector, and the unequal distribution of health personnel resources across the country (Yao, 2019). In addition, insufficient medical personnel and epidemiological alert systems to anticipate climate-related diseases, as well as a lack of knowledge about the links between climate change and health, complicate the implementation of effective adaptation strategies. However, Clean Cooking Planning Tool of the World Bank (2023) reveals that a strategic public investment of US$147 million per year until 2030 could radically transform the health of the Ivorian population. This initiative would aim to develop the market for clean cooking solutions, make these technologies accessible to the most vulnerable households and catalyze private investment.

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In this context, this research therefore aims to economically analyze the priority adaptation options defined for the Ivorian health sector. The overall objective is to quantitatively evaluate the costs and impacts of these measures in order to provide decision-makers with evidence-based information to guide their political decisions. This rigorous analytical approach will contribute to the development of a financially sustainable and socially appropriate adaptation strategy.

1.2 Conceptual framework

The conceptual framework of this study is based on an integrated approach to the economic evaluation of climate adaptation options in the health sector in Côte d'Ivoire. This approach is based on the theoretical foundations established by Parry et al. (2009), who define health adaptation costs as encompassing a wide range of policy interventions (WHO, 2013; WHO, 2008). These interventions range from improving health surveillance systems to substantially modifying hospital infrastructure, with the aim of effectively addressing the challenges posed by global warming.

This multidimensional perspective finds its scientific legitimacy in the conceptual framework developed by the World Health Organization for Africa (WHO, 2011, 2019a), specifically designed for public health adaptation to climate change. This framework aims to provide a coordinated, scientifically based response tailored to the specific adaptation needs of African countries in the face of emerging climate challenges.

The first level of our conceptual framework establishes the causal chain of triggers that justify economic evaluation. This sequence begins with the identification of climate change as a determining factor, progressing to the emergence of climate-sensitive diseases, and then to the identification of systemic constraints that affect the health system's response capacity. This logical progression leads naturally to the urgent need for a rigorous economic evaluation of available adaptation options.

The second level operationalizes the priority adaptation options identified for the Ivorian context. These options include three strategic axes: community awareness campaigns, which aim to strengthen the preventive capacities of populations; epidemiological monitoring committees, which constitute a surveillance and early warning mechanism; and resilient hydraulic infrastructure, which represents the structural adaptation of the health system to new climate challenges.

The third level integrates the economic dimension through the quantification of impacts. This quantification distinguishes between direct costs, represented by health services, and indirect costs, which include productivity losses and lives lost (Murray, 1994; WHO, 2013). This methodological distinction allows for a comprehensive assessment that leads to strategic implications and policy recommendations.

Economic evaluation, as defined by Drummond et al. (1998), is "the comparative analysis of various options in terms of their costs and consequences". This definition guides our methodological approach by allowing us to estimate net benefit-cost ratios in monetary terms (USAID, 2016; OECD, 2015; UNFCCC, 2011), thus facilitating informed decision-making based on quantitative evidence.

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2.0 METHODOLOGY

2.1 Data collection methods

This study used a mixed methodological approach integrating four complementary data collection strategies over a period of thirty days. Methodological triangulation was ensured by a comprehensive documentary review covering specialized literature, technical expertise reports and sectoral policy documents, supplemented by the analysis of activity reports, institutional reports and statistical yearbooks of the targeted localities. The empirical investigation was carried out through a seven-day field mission in six strategic localities (Korhogo, Dimbokro , Man, Taabo , Odienné and Bouaké), combining semi-structured interviews and public consultations with a diverse sample of actors including managers of decentralized sectoral structures, decentralized authorities, economic operators in the environment-health sector and representatives of local populations. At the central institutional level, the consultations targeted the Directorate of Public Hygiene and Environmental Health (DHPSE) and the Coordination Directorate of the National Malaria Control Program (DC-PNLP). Participatory data collection was operationalized by providing standardized data sheets to local stakeholders in health development structures, allowing a decentralized and collaborative approach to updating data from the Centre Suisse de Recherches Scientifiques en Côte d'Ivoire (CSRS).

2.2 Framework for identifying and prioritizing adaptation options

This method aims to guide the selection of criteria to identify and prioritize adaptation options in the context of broader economic, environmental, and social development objectives. It relies on robust multi-criteria analysis (MCA) to effectively prioritize available adaptation options.

The method illustrates a three-level multi-criteria framework: inputs (additional benefits and cost-benefit comparisons), dimensions (economic, social, environmental, gender and technological), and specific criteria.

The identification uses six criteria via participatory rating: effectiveness of the action, additional social and environmental benefits, social and cultural acceptability, cost-benefit analysis, and gender benefits.

Prioritization involves two distinct steps: ranking each option according to the six established criteria, then building a consensus among stakeholders on the final score determining priority.

The process involves ministries of public health, the environment, and other sectors. This collaborative approach uses a standardized form to ensure consistency and transparency in the assessment.

2.3 Economic assessment framework for adaptation options

The economic evaluation of adaptation options is based on a multi-criteria approach integrating three complementary methods in line with international recommendations. Indeed, this approach ensures a comprehensive and balanced evaluation of the different options. Regarding the evaluation of the costs of adaptation options, it was based on bibliographic research and the

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use of secondary data from existing adaptation projects. The costs of adaptation options are calculated as the sum of investment costs, operating costs and research and expertise costs. Cost-benefit analysis (CBA) is the most commonly used method to evaluate adaptation options when effectiveness is the only decision criterion. This methodological approach was used to evaluate and compare all costs and benefits in equivalent monetary terms. Indeed, this method, by integrating a contingency assessment exercise, mobilizes the statistical value of a human life (SVL), determined by the societal willingness-to-pay approach to reduce exposure to risk (De Salazar et al., 2007; Larrivée et al., 2015).

3.0 RESULTS AND DISCUSSION

3.1 Priority adaptation options

3.1.1 Prioritization of adaptation options using multi-criteria analysis (MCA)

The prioritization step results in a ranking of each adaptation option in relation to each of the criteria. A rating scale ranging from 0 to 5, with 0 as the option to exclude the class from 1 to 5 of which 5 is the category of primary importance.

To produce the list of priority adaptation options, a consensus was built around a certain score for which an adaptation option is considered to be prioritized. As part of the analysis, the average of the total score of the points obtained was used to define a list of adaptation options to be considered in the prioritization. The three adaptation options prioritized according to the criteria defined by Trærup and Bakkegaard (2015) are:

- the "implementation of a program to raise awareness among the population about climate-sensitive diseases" with a score of 4.7, which is considered the first-rate option;
- the "establishment of monitoring, information and action committees on climate-sensitive diseases" (4.3), in second position;
- the "development of climate-resilient hydraulic, sanitation and drainage infrastructure" (4.2), lastly.

3.1.2 Economic assessment of the costs of priority adaptation options

The economic assessment reveals differentiated annual costs depending on the adaptation options analyzed.

Adaptation option 1: Implementation of a program to raise awareness among the population about climate-sensitive diseases

Option 1, relating to the establishment of a population awareness program on the risks associated with climate-sensitive diseases, aims to increase awareness and the capacity to detect high-risk health hazards and prepare their response in a timely manner, for example by purchasing vaccines or medicines, etc. (WHO, 2019b). In addition to the health risks of diseases linked to climate change, this option includes activities to raise public awareness on the correct use of long-lasting insecticide-treated mosquito nets. The cost of this option is estimated at 9.6 billion FCFA for a five-year awareness strategy, or 1.9 billion FCFA per year. To obtain the latter, the minimum cost of an awareness-raising strategy, i.e. 1,148.17 FCFA

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(Désille & Rangama, 2013), was weighted by 30% of the total population (28,088,455 inhabitants) that the country had in 2021. It should be noted that the cost obtained only represents approximately 7% of the estimated cost of the PNDS 2016-2020 (MSHP, 2020). Furthermore, the Participatory Hygiene and Sanitation Transformation (PHAST) approach, which was used to calculate the cost of the adaptation option, does not specifically target climate-sensitive diseases. However, the advantage lies in the fact that it is intended to intervene in the prevention and promotion of health and public hygiene (Désille & Rangama, 2013).

Adaptation option 2: Establishment of monitoring, information and action committees on climate-sensitive diseases

Based on the analysis and field consultations, adaptation option 2 was proposed, which concerns the establishment of monitoring, information, and action committees on climate-sensitive diseases. The objective of these committees is to develop arguments and evidence to encourage the commitment of populations, professional organizations, and civil society in the effective management of health risks and impacts related to climate events. In this context, they will be responsible for promoting the outputs of monitoring and specific information systems to local stakeholders. However, strategically, the creation of a national monitoring, information, and action committee on climate-sensitive diseases is envisaged to ensure the coordination of their actions at the local level. These actions may include strengthening vector control, operationalizing health committees at the regional level, and establishing an early warning system for risks and disasters. In this regard, the literature indicates that health-climate monitoring teams or those on climate-sensitive diseases are multidisciplinary and include scientific experts in climate, health, socio-economics, but also teachers and researchers in the field of biodiversity and eco-toxicology (MEDDTL, 2011). Their mission is to periodically review the literature on the subject of climate change, evaluate the data, alert the public authorities and issue various management recommendations such as research or studies, training, monitoring measures, or in-depth risk assessment by health laboratories. In other words, it is a question of establishing a scientific monitoring of the state of available knowledge of the impacts of climate change on health (Toussaint et al., 2015).

Thus, two essential components emerge from this adaptation option, namely the aspect of epidemiological surveillance and that of the response to the effects of climate change on health. From a financial point of view, the activities of the first component can be developed by an estimated funding of 1.3 billion FCFA for the year. This figure is aligned with the allocation granted by the French Development Agency (AFD) to phase 3 of the project to strengthen regional epidemiological surveillance and alert management networks (SEGA- One Health) in the member states of the Indian Ocean Commission (IOC), namely Madagascar, the Union of the Comoros, France/Réunion, Mauritius and the Seychelles (Onno, 2019). As for the component comprising the development and implementation of IEC systems, it requires the allocation of an annual allocation of one billion FCFA, in reference to the EU contribution for the establishment of the Multisectoral Nutrition Information Platform (PNMIN, 2017) in Côte d'Ivoire. To this, it should be added that the product of the minimum unit cost of 3,967.84 FCFA and the number of malaria cases (3,754,504), i.e. 14.9 billion FCFA can be used to estimate the cost of vector control interventions (WHO, 2017). It turns out that the adaptation

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option relating to the establishment of "health-climate" monitoring, information and action committees will cost 17.3 billion FCFA per year.

Adaptation Option 3: Development of climate-resilient water, sanitation and drainage infrastructure

In recent years, significant efforts have been made to strengthen the drinking water supply in Côte d'Ivoire. As it appears, adaptation option 3 on the development of climate-resilient water, sanitation and drainage infrastructure is considered a strategic support for reducing inequality in the provision of water, sanitation and drainage infrastructure, already underway through the implementation of several government projects.

In order to guarantee access to drinking water for all populations, the State of Côte d'Ivoire invested more than 600 billion FCFA from 2011 to 2020 in the extension of the integrated water supply network of the Société de Distribution d'Eau de Côte d'Ivoire (SODECI) . In addition, the operation, totaling 17 billion FCFA, is included in the government's social program for the repair, rehabilitation and maintenance of 21,000 human-powered pumps over a period of 3 years. These investment efforts bring the current access rates in urban areas to 83% and in rural areas to more than 73% (Ministry of Hydraulics, 2019). This means that the State will have to invest an estimated amount of 14.4 billion FCFA per year to achieve 100% connection to the public drinking water network by 2020. However, determining the cost of option 2 requires taking into account the variability in rainfall, the frequency and intensity of droughts and the increasing uncertainty regarding future hydrological conditions due to climate change. This requires that an additional incremental cost of 80% (11.5 billion FCFA) for the development of the sanitation and drainage network be applied to this investment amount. The cost of option 3 "development of climate-resilient hydraulic, sanitation and drainage infrastructure" is therefore estimated at 26.9 billion FCFA per year.

A detailed analysis of the cost structure reveals a standardized distribution between investments (30%) and operating costs (70%) for all options. Operating costs are dominated by personnel costs (40% of the total), reflecting the importance of human resources in implementing adaptation strategies. Investments are distributed equally between buildings, equipment, and vehicles (10% each).

The total estimated cost of the three adaptation options amounts to 46.1 billion FCFA, representing the annual investment required to implement the overall adaptation strategy for the health sector.

3.2 Costs associated with non-adaptation

The analysis of the costs associated with non-adaptation or inaction in the health sector makes it possible to estimate three types of costs: those of the use of health services, those of morbidity or reduced productivity, and those of lives and quality of life lost.

3.2.1 Health service costs related to climate-sensitive diseases

Healthcare costs, or direct costs of managing illnesses, include medical care, treatments, and medications. The benchmark analysis estimates the cost of major targeted illnesses, which includes data on the average costs of hospital care, medical care, and medications.

Also included in healthcare costs are the costs of healthcare personnel, including health infrastructure and equipment, for the management of interventions for cases of climate-sensitive diseases.

Regarding the determination of health care costs related to disease cases, it should be noted that the different costs presented were extrapolated from field survey data and bibliographic research (Couitchéré et al., 2005; Faye et al., 2010; Nkemba et al., 2014; Tchicaya et al., 2014; Koné et al., 2014; MSHP, 2017; Coulibaly et al., 2019). It appears that the total cost of health services relating to the targeted climate-sensitive diseases is therefore estimated at 117.2 billion FCFA.

3.2.2 Costs of morbidity or reduced productivity related to climate-sensitive diseases

Morbidity costs refer to productivity losses and are estimated by the product of the number of individuals affected and those related to average losses of income and working time per individual. They express the losses of income and working time in the event of inability to work or participate in other activities due to environmental conditions or illness. Based on information from public consultations and the literature, the number of cases of morbidity and premature death attributable to climate-sensitive diseases is presented as given. As for the costs of average productivity losses, it gives rise to two scenarios (OFDT, 1998; CICC, 2021). Indeed, this indicator is composed of the costs of lost work income and the costs of lost work time due to illness. The estimate of the costs of lost work income due to premature death is obtained by multiplying the number of deaths by the income that the person concerned should have received. Furthermore, the costs of lost working time due to illness are calculated by multiplying the duration of hospitalizations and medical consultations for the diseases under study by the average wage rate. However, the difficulty of defining these parameters and the lack of field data and information did not allow the application of the cost calculation approaches described above. Thus, to produce the cost of morbidity, it was agreed to weight an average cost of losses (43,790 FCFA) during seven (7) working days by 14.5% of the total number of cases in the general population in 2016 (Kouadio et al., 2006; MSHP, 2017; Coulibaly et al., 2019).

The costs of morbidity related to climate-sensitive diseases are estimated from the extrapolation of data from the studies of Kouadio et al. (2006), MSHP (2017) and Coulibaly et al. (2019). Ultimately, the analysis indicates that the total cost of morbidity and premature death linked to climate-sensitive diseases is estimated at 36.3 billion FCFA.

3.2.3 Costs of lives and quality of life lost due to climate-sensitive diseases

In this study, the costs of lives and quality of life were reduced to the value of the universal health coverage (CMU) contribution. This amount, which represents the costs to be borne by the country to save lives and ensure quality of life, was considered as the willingness to pay to prevent premature deaths linked to the three targeted climate-sensitive diseases. Indeed, the government set the contributory value to the basic general scheme at 1,000 FCFA (1.52 euros)

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per month and per person, or 12,000 FCFA per year (18.29 euros). The costs of lives and quality of life lost were obtained after weighting the morbidity and mortality data attributable to climate-sensitive diseases by the additional cost of the CMU contribution. The cost of lives and quality of life lost due to climate-sensitive diseases is 68.6 billion CFA francs.

Ultimately, the costs associated with non-adaptation are estimated at 222.1 billion CFA francs. However, to take into account the protection of biodiversity and ecosystem services in adaptation measures (Mathy, 2015; Aubertin et al., 1996), this amount will be supplemented by the incremental cost of 17.6 billion CFA francs. According to Dessus and Cornut (1994) and Aubertin et al. (1996), this cost represents the additional cost associated with implementing global environmental protection actions and, to a certain extent, corresponds to the GEF-FFEM's willingness to pay in the sustainable development funding allocation rule. This additional amount brings the total aggregate cost of the two adaptation options in the health sector to 239.7 billion CFA francs.

Consequently, the assessment revealed that the costs of prioritized adaptation options amounted to 46.1 billion CFA francs, or 17% of the total aggregate cost. Furthermore, calculating the total costs associated with non-adaptation (or baseline costs) yields an amount of 222.1 billion CFA francs, the majority of which is 83%. Considering the latter as the cost of non-adaptation, increasing prioritized adaptation options can improve populations' resilience to the health impacts of climate change.

3.3 Strategic implications

3.3.1 Climate adaptation: a more profitable investment than inaction

The results of this assessment reveal a significant economic paradox: the costs of non-adaptation (83% of the total budget) far exceed those of adaptation measures (17%). This pattern suggests that a proactive adaptation investment strategy could generate substantial savings in the long term. As Dessus and Cornut (1994) point out, the preventive approach to climate adaptation generally presents a favorable cost-benefit ratio compared to reactive strategies.

The predominance of health service costs (44% of the total) confirms the observations of Aubertin et al. (1996) on the importance of curative costs in the health systems of developing countries in the face of climate challenges. This situation calls for a strategic reorientation towards preventive approaches, likely to significantly reduce the overall economic burden.

3.3.2 Adaptation priorities: Balancing infrastructure, awareness and monitoring to strengthen climate resilience

Option 3 (hydraulic infrastructure) presents the highest cost but potentially offers the most lasting benefits. According to Mathy (2015), infrastructure investments constitute "no regrets" adaptation measures because they generate co -benefits even in the absence of severe climate change. This approach is in line with the logic of protecting biodiversity and ecosystem services recommended by international experts.

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Option 1 (awareness raising) has the best immediate cost-effectiveness ratio but requires regular renewal to maintain its effectiveness. Toussaint et al. (2015) highlight the importance of awareness raising in reducing climate-related health risks, particularly for vulnerable populations.

Option 2 (monitoring committees) offers an interesting balance between cost and systemic impact. It responds to the recommendations of the MEDDTL (2011) on the need for multidisciplinary teams for climate health monitoring, integrating experts in climate, health and socio-economics.

3.3.3 Capacity building for professionals and integrated prevention: an approach to reducing adaptation costs in the face of climate change-related diseases

The results suggest several areas for optimization. First, strengthening the capacity of health personnel on climate-sensitive diseases could significantly reduce treatment costs. Second, scaling up vector control interventions, which represent a significant portion of the costs in Option 2, could generate substantial economies of scale. In accordance with international recommendations, integrating vaccinations and preventive campaigns into adaptation strategies is a significant option for reducing the overall burden of morbidity and mortality (WHO, 2019b). This approach could reduce the 104.9 billion FCFA in morbidity and quality of life costs identified. Compared to the World Bank nutrition project ($60.4 million), the identified needs confirm Yao's (2019) projections on the upward reassessment of climate finance, while the alignment with AFD standards for the SEGA-One Health project in the IOC region validates the methodological robustness and credibility of the estimates for epidemiological surveillance.

4.0 CONCLUSION

This study provided a comprehensive economic assessment of climate change adaptation options in the health sector in Côte d'Ivoire, revealing the considerable financial stakes needed to strengthen the resilience of the health system. The analysis shows that the total aggregate cost of adaptation options amounts to 268.2 billion FCFA, with a revealing structure: 17% for proactive adaptation measures and 83% for non-adaptation costs. This research significantly contributes to the literature on the economic valuation of climate adaptation by providing a robust methodology and actionable results for decision-makers. It demonstrates that investment in health adaptation, although substantial, represents an economically rational strategy in the face of the increasing costs of climate change. The recommendations arising from this analysis call for an integrated approach combining the three adaptation options, strengthening capacity to collect health and climate data, and increasing the mobilization of international adaptation finance. The success of this strategy will also require strengthened inter-sectoral coordination and sustained political commitment at the highest levels of government. Faced with the climate emergency and growing health vulnerabilities, this economic assessment provides the decision-making tools needed to direct public investments towards effective and sustainable adaptation strategies, thus contributing to the construction of a resilient health system in Côte d'Ivoire.

REFERENCES

Aubertin, C., Alpha, A., & Robert, O. (1996). Etude coût incrémental et protection de la biodiversité. (FFEM, Éd.) Bondy: ORSTOM.

World Bank. (2023). Côte d'Ivoire. Rapport National sur le Climat et le Développement. Washington, DC 20433: World Bank Publications.

World Bank. (2018). Pour que demain ne meure jamain. La Côte d'Ivoire face au changement climatique. World Bank Publications. http://documents1.worldbank.org/curated/en/470341530853819903/pdf/Pour-que-Demain-ne-Meure-Jamais-La-Cote-dIvoire-Face-au-Changement-Climatique.pdf

CICC [Canadian Institute for Climate Choices]. (2021). Les coûts des changements climatiques pour la santé : comment le Canada peut s'adapter, se préparer et sauver des vies. https://choixclimatiques.ca/wp-content/uploads/2021/06/ChoixClimat_Cou%CC%82tsSante%CC%81_Juin2021.pdf

Couitchéré, G., Niangué-Beugré, M., Oulaï, S., Kouma, M., Yao, A., Atimère, Y. N., & Andohal, J. (2005). Évaluation des coûts directs de la prise en charge du paludisme grave de l'enfant à l'hôpital général de Bonoua, Côte d'Ivoire. French Society of Pediatrics (Société Française de Pédiatrie / SFP), 12(3), 332-376. doi:doi:10.1016/j.arcped.2004.12.009

Coulibaly, M., Eba, K. A., & Anoh, K. P. (2019). Analyse des conséquences économiques et sanitaires de l'assainissement public dans la ville d'Abidjan (Côte d'Ivoire). Revue Espace, Territoires, Sociétés et Santé, 1(2), 109-125. https://www.retssa-ci.com/index.php?page=detail&k=35

De Salazar, L., Jackson, S., Shiell, A., & Rice, M. (2007). Guide d'évéluation économique des programmes de promotion de la santé. Washington (D.C.): Organisation Panaméricaine de la Santé (OPS).

Désille, D., & Rangama, J. (2013). Concevoir et mettre en oeuvre. une stratégie de sensibilisation à l'hygiène et de promotion de l'assainissement. Des repères pour l'action. Programme Solidarité Eau. Bamako: Agence Française de Développement (AFD).

Dessus, B., & Cornut, P. (1994). La notion de coût incrémental dans le cadre de la Convention Climat et du FEM (Programme Ecotech). CNRS.

Dongo, K., Kouamé, F. K., Koné, B., Biém, J., Tanner, M., & Cissé, G. (2008). Analyse de la situation de l'environnement sanitaire des quartiers défavorisés dans le tissu urbain de Yopougon a Abidjan, Côte d'Ivoire. VertigO - la revue électronique en sciences de l'environnement(8-3. Décembre 2008). doi:10.4000/vertigo.6252

Drummond, M., O'Brien, B., Stoddart, G., & Torrance, G. (1998). Méthodes d'évaluation économique des programmes de santé (2e edition). Paris: Economica.

Faye, A., Ndiaye, P., Diagne-Camara, M., Badiane, O., Wone, I., Diongue, M., Seck, I., Dia, A.-T., & Dia, A.-L. (2010). Évaluation économique des tests de diagnostic rapide dans le traitement du paludisme. Santé Publique, 22, 617-623. doi:10.3917/spub.106.0617

Fossou, N. R., Soro, G. E., Dosso, S., & Goné, D. L. (2020). Variabilité de la pluviométrie en Afrique de l'ouest : cas de la région du N'Zi au Centre-Est de la Côte d'Ivoire. Rev. Ivoir. Sci. Technol., 36, 171-192.

Kanga, K. H., Kouassi, K., Brissy, O. A., & Assi-Kaudjhis, J. P. (2021). Variation saisonnière du paludisme et risque de perturbation du calendrier agricole dans le District sanitaire de Bouaké Sud. RETSSA. https://www.retssa-ci.com/index.php?page=detail&k=41

Koné, B., Doumbia, M., Sy, I., Dongo, K., Agbo-Houenou, Y., Houenou, P. V., Fayomi, B., Bonfoh, B., Tanner, M., & Cissé, G. (2014). Étude des diarrhées en milieu périurbain à Abidjan par l'approche écosanté. VertigO - la revue électronique en sciences de l'environnement(Hors-série 19). doi:10.4000/vertigo.14976

Kouadio, A., Cissé, G., Obrist, B., Wyss, K., & Zingsstag, J. (2006). Fardeau économique du paludisme sur les ménages démunis des quartiers défavorisés d'Abidjan, Côte d'Ivoire. VertigO - la revue électronique en sciences de l'environnement(Hors-série 3). doi:10.4000/vertigo.1776

Kouamé, P. K., Fokou, G., Koffi, A. J., Sani, A., Bonfoh, B., & Dongo, K. (2022). Assessing Institutional Stakeholders' Perception and Limitations on Coping Strategies in Flooding Risk Management in West Africa. International Journal of Environmental Research and Public Health, 19(11), 6933. doi:10.3390/ijerph19116933

Kouassi, A. M., Kouamé, K. F., Koffi, Y. B., Bernard, D. K., Paturel, J. E., & Oulare, S. (2010). Analyse de la variabilité climatique et de ses influences sur les régimes pluviométriques saisonniers en Afrique de l'Ouest : cas du bassin versant du N'zi (Bandama) en Côte d'Ivoire. Cybergeo : European Journal of Geography, Environnement, Nature, Paysage(513). doi:10.4000/cybergeo.23388

Larrivée, C., Sinclair-Désgagné, N., Da Silva, L., Revéret, J.-P., & Desjarlais, C. (2015). Evaluation des impacts des changements climatiques et de leurs coûts pour le Québec et l'État québécois. Rapport d'étude, Ouranos.

Mathy, S. (2015). Pour la création d'une fenêtre de financement pauvreté-adaptation-atténuation dans le Fonds Vert Climat. Natures Sciences Sociétés, 23(supplément), S29-S40. doi:10.1051/nss/2015016

MEDDTL [Ministère de l'Ecologie, du Développement Durable, des Transports et du Logement]. (2011). Plan national d'adaptation de la France aux effets du changement climatique 2011-2015. https://www.preventionweb.net/files/20915_20913pnaccversioncompletepdf211.pdf

MSHP [Ministère de Santé et de l'Hygiène Publique]. (2017). Rapport annuel sur la situation sanitaire 2016. Abidjan: Ministère de Santé et de l'Hygiène Publique.

MSHP. (2020). Plan National de Développement Sanitaire (PNDS) 2016-2020. Abidjan. https://www.childrenandaids.org/sites/default/files/2017-11/pnds_2016-2020.pdf

Murray, C. J. (1994). Quantifying the burden of disease: the technical basis for disability-adjusted life years. WHO Bulletin, 72(3), 429-445.

N'Guessan, A. J., Yoboue, K. B., & N'Daoule, R. (2015). La variabilité pluviométrique et ses impacts sur l'alimentation en eau des milieux ruraux du département de Dimbokro (Centre-Est de la Côte d'Ivoire). European Scientific Journal, 11(35), 36–57.

N'Krumah, T. A., Koné, B., Tiembre, I., Mbaye, I., Tanner, M., & Cissé, G. (2014). Variabilité climatique et incidence de la méningite cérébro-spinale dans le district sanitaire de Korhogo (Nord de la Côte d'Ivoire). Environnement, Risques & Santé, 13(2), 144-52. doi:doi:10.1684/ers.2014.0687

Nkemba, B., Cishibanji, M., Bashi-Mulenda, M., & Mashimango, B. (2014). Prise en charge et coût des soins d'un épisode du paludisme dans la zone de santé de Miti-Murhesa, République Démocratique du Congo. International Journal of Innovation and Applied Studies, 8(3). http://www.ijias.issr-journals.org/

OECD. (2015). Climate Change Risks and Adaptation: Linking Policy and Economic. Paris: , OECD Publishing. http://dx.doi.org/10.1787/9789264234611-en

OFDT [Observatoire Français des Drogues et des Toxicomanies]. (1998). Vers l'analyse du coût des drogues illégales. Un essai de mesure du coût de la politique publique de la drogue et quelques réflexions sur la mesure des autres coûts. Paris: Association de Recherches sur les Marchés Informels. https://bdoc.ofdt.fr/doc_num.php?explnum_id=5650

Onno, S. (2019). L'AFD accorde Rs 310 millions à la COI pour la 3e phase du projet "S.E.G.A". COI et ses projets. Veille sanitaire. Revue de presse de la COI du 02 au 08 mars 2019. Centre de documentation. https://www.mbcradio.tv/article/lafd-accorde-rs-310-millions-%C3%A0-la-coi-pour-la-3e-phase-du-projet-%C2%AB-sega-%C2%BB

Parry, M., Arnell, N., Berry, P., Dodman, D., Fankhauser, S., Hope, C., Kovats, S., Nicholls, R., Satterthwaite, D., Tiffin, R., & Wheeler, T. (2009). Assessing the Costs of Adaptation to Climate Change: A Review of the UNFCCC and Other Recent Estimates. London: International Institute for Environment and Development and Grantham Institute for Climate Change. https://www.iied.org/sites/default/files/pdfs/migrate/11501IIED.pdf

PNMIN [Plateforme Nationale Multisectorielle d'Information pour la Nutrition]. (2017). Description de l'action. Annexe I contrat FOOD/2017/392-598, Abidjan.

RCI [République de Côte d'Ivoire]. (2010). Seconde Communication Nationale sous la Convention Cadre des Nations Unies sur les Changements. MINEEF ; GEF ; UNEP ; UNFCCC.

RCI. (2014). L'agriculture Intelligente face au Climat en Côte d'Ivoire : état des lieux et besoins d'appui pour mieux intégrer l'Agriculture Intelligente face au Climat (AIC) dans le Programme National d'Investissement Agricole (PNIA). Communication-Pays. Abidjan: République de Côte d'Ivoire.

SODEXAM [Société d'Exploitation et de Développement Aéroportuaire, Aéronautique et Météorologique]. (2021). Température et vagues de chaleurs. Prévision météorologique et veille climatique.

Tchicaya, A.-F., Wognin, S.-B., Aka, I., Kouassi, Y.-M., Guiza, J., & Bonny, J.-S. (2014). Impacts professionnels et économiques du paludisme à Plasmodium falciparum sur une entreprise du secteur privé en Côte d'Ivoire. Archives des Maladies Professionnelles et de l'Environnement, 75(4), 406-411. doi: 10.1016/j.admp.2014.02.005

Toussaint, J.-F., Alles, M., André, J.-C., Berthelot, G., Billaud, E., Boeuf, G., & Buthion, V. (2015). Impacts sanitaires de la stratégie d'adaptation au changement climatique. Méthodologie de recherche et d'évaluation. Observatoires et recommandations. Groupe Adaptation et prospective du Haut Conseil de la santé publique. https://www.actu-environnement.com/media/pdf/news-27172-HCSP-rapport-climat-sante.pdf

Trærup, S. L., & Bakkegaard, R. K. (2015). Evaluer et prioriser les technologies d'adaptation au changement climatique. Orientations pratiques pour une analyse multicritères et l'identification et évaluation de critères afférents. UNEP DTU Partnership.

UNFCCC. (2011). Assessing the Costs and Benefits of Adaptation Options. An Overview approach. Bonn.

USAID. (2016). Analyzing the Economic Costs and Benefits of Climate Change Adaptation Options. A how-to example from the pacific cost-benefit analysis initiative. Adaptation Finance Knowledge Series (4). https://weadapt.org/wp-content/uploads/2023/05/usaidadapt_afks4_pacificcba_jan2016.pdf

WHO. (2008). WHO guide for standardization of economic evaluations of immunization programmes. World Health Organization. https://apps.who.int/iris/handle/10665/69981

WHO. (2011). Framework for Public Health Adaptation to Climate Change in the African Region (Document AFR/RC61/10). Regional Committee for Africa, 61. World Health Organization. Regional Office for Africa.

WHO. (2013). Climate change and health: a tool to estimate health and adaptation costs. Copenhagen: WHO Regional Office for Europe.

WHO. (2017). Action mondiale pour lutter contre les vecteurs. Soixante-Dixième Assemblée Mondiale De La Santé. Point 14.2 de l'ordre du jour provisoire. Soixante-Dixième

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Assemblée Mondiale De La Santé. Point 14.2 de l'ordre du jour provisoire: https://apps.who.int/gb/ebwha/pdf_files/WHA70/A70_26-fr.pdf

WHO. (2019a). Rapport de situation sur la mise en oeuvre de l'adaptation de la santé publique au changement climatique dans la région africaine. Brazzaville: OMS-Afrique.

WHO. (2019b). Projet de budget programme 2020-2021. OMS.

WHO. (2021). Cost-effectiveness analysis for health interventions. https://www.who.int/heli/economics/costeffanalysis/en/

Yao, M. (2019). Etat des lieux de la mise en oeuvre des NDC de la Côte d'Ivoire: Volet Adaptation aux changements climatiques. Abidjan: République de Côte d'Ivoire.

