

## International Year of Astronomy

### Will it awake Africa?

Nceba Mhlahlo

The United Nations (UN) has declared 2009 the International Year of Astronomy (IYA). All around the world, from local, national, regional and international levels, there will be events to promote astronomy and to showcase and celebrate the splendid achievements in space science. The IYA programme is intended to attain at least four of the seven Millennium Development Goals (MDGs), two of which deal explicitly with education and are discussed in this paper: universal primary education; and gender parity and development of women. But given the continent's development problems – most of which centre on poverty – lack of infrastructure, and gender disparities and inequality, will IYA make an impact? The aim of this paper is to analyse factors that might limit the attainment of these goals and the success of IYA, particularly in Africa, to review public policy issues, especially in the areas of universal primary education, gender equality and parity and funding, and to advocate public policy intervention and alignment in these areas.

#### Introduction

IYA is a global astronomy initiative that was initiated in 2003 by the International Astronomical Union (IAU), an organisation that promotes and safeguards the science of astronomy through international cooperation. This initiative was endorsed by the resolution of the General Conference of the United Nations Educational, Scientific and Cultural Organisation (UNESCO),<sup>1</sup> and that of the UN,<sup>2</sup> which both declared 2009 an international year of astronomy. Through this undertaking it is

thought that astronomy will help in achieving at least four of the seven Millennium Development Goals (MDGs).<sup>3</sup> Two of these goals, which are also Education For All (EFA) goals,<sup>4</sup> deal explicitly with education and are considered here, and they are: to help achieve universal primary education (UPE); and promote gender equality and empower women.

The goal of UPE is to enroll in schools 35 million primary-aged children who receive no schooling in sub-Saharan Africa.<sup>5</sup> One of the major challenges to achieving this goal is poverty.

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Many households in Africa live on less than \$2 a day,<sup>6</sup> and as a result, many parents are unable to carry the out-of-school costs of education, such as school fees and uniform. This undoubtedly affects access to education, as does the shortage of trained schoolteachers. According to the Education for All Global Monitoring Report 2009, there is a serious lack of trained teachers, particularly in sub-Saharan Africa, and in this region alone, between 1.6 and 4 million additional teachers are needed to reach EFA by 2015.<sup>7</sup> Without teachers to teach the learners, UPE cannot be achieved.

Another MDG that IYA seeks to attain is gender equality and parity in education. In sub-Saharan Africa, the majority of the nearly 35 million children who receive no schooling are girls. The effects of this situation become evident in the long term, especially in fields such as physics and astronomy, where women participating in these fields are few. For instance, approximately a quarter of professional astronomers in the world are women, and some countries have no female professional astronomers at all.

**The IYA2009 programme intends to contribute, first to UPE by attracting the youths to the discipline of science through astronomy activities that can draw public attention and interest.** To inspire young disadvantaged children with the beauty of the universe, an international outreach activity – Universe Awareness (UNAWA) – will be started where games, songs, hands-on activities, cartoons and live Internet exchanges are devised throughout the world for children from the age of four onwards. Furthermore, IYA2009 programme is developing a simple, easy-to-assemble and easy-to-use telescope that can be distributed by the millions, and which people can take home.<sup>8</sup> It is hoped that this endeavor will go a long way in attracting children and the youths to schools, and later to astronomy, even after IYA2009. IYA2009 is also embarking on a training programme to train teachers all around the world in order to empower them with teaching skills and the ability to teach using technology in the classroom.<sup>9</sup>

To address the problem of gender disparities, IYA intends to start programmes that will present female scientists as role models to girls, and which will **lobby support from prestigious initiatives to provide fellowships for female scientists to develop and further their careers.**<sup>10</sup>

Studies have shown that those most affected by the problems of access to education and gender balance are children from poor households, rural areas, slums and other disadvantaged groups.<sup>11</sup> **The challenges faced by these groups such as poverty, school fees, out-of-school costs of education,**

**infrastructure, etc., mean that the role of IYA in addressing UPE and gender parity is very limited. IYA is a very focused activity which is mainly interest- and amusement based, and cannot tackle problems related to poverty, etc., in a short term. Something more needs to be done by governments in terms of policy.** Unfortunately, studies have shown that policies of many governments are not adequate to reach the poor groups. By adequate it means they do not reflect (i) the socio-economic realities and needs of the society; (ii) the realities of the changing and progressing global world; (iii) they are not aligned with global initiatives; and (iv) some are not practical/implementable.

Public policy intervention by governments is, therefore, crucial to protect the vulnerable that form the same majority that the MDGs want to reach. This intervention should promote pro-poor and practical policies, such as the abolition of school fees, the construction of schools, and increased teacher recruitment. It should also promote alignment of policies of governments with global initiatives and efforts such as UPE and IYA, and support these initiatives. But for these policies to succeed, governments will have to revisit their funding policies, as increased funding is required.

In this paper it is argued that efforts through IYA2009 alone are not enough to meet these stated challenges. Public policy intervention, especially around the issues of UPE, gender parity, training and development, and funding is advocated. Policy recommendations are then made to meet the MDGs in Africa.

## Public Policy Issues

To reach UPE and gender parity, and for policies of governments to meet (i)-(iv) stated, governance reforms are required. For instance, UPE relies on enrolment rates for its success, among other things, and there are a number of issues or needs that stand in the way of increasing enrolment rates in primary schools. Those that face parents directly (out-of-pocket costs of education) such as school fees, food, uniform and books, to count a few, and those that are traditionally government responsibilities, such as poverty alleviation programmes, building of infrastructure, human capital development, etc. These needs should be addressed aggressively by policies of governments as they are basic to the achievement of UPE and gender parity.

This paper will turn to these needs, and look at how government policies can be revised to address them.

## Universal Primary Education

The average gross enrolment ratio in Africa is low, and remained at 14% in 2006. It is expected that by 2015 all countries will have reached UPE by increasing this percentage to 100%; however, at the pace that changes are happening, this seems very unlikely. What is the current position regarding UPE in Africa? There is a problem of poverty, where more than 70% of people live on less than \$2 a day, and more than 40% live in extreme poverty in sub-Saharan Africa.<sup>12</sup> This means that the out-of-pocket costs of education are undoubtedly a burden to many households. Some African countries have begun to realise this, as they have abolished school fees and are supplying books to learners. As a result of this intervention there has been a clear correlation between free tuition at primary level and enrolment rates in some countries such as Tanzania, Ethiopia, Lesotho and Botswana. Net enrolment rates increased after school fees were abolished in these countries.<sup>13</sup> Yet, an estimated 77 out of 94 poor countries, mostly in Africa, still charge some type of fee for basic education. Even in those countries where school fees have been abolished, implementation of the school fees policy seems to be a problem, as there are cases where learners are sent home or their examination results withheld because of non-payment of school fees. According to the ACCESS report,<sup>14</sup> the view from some of the schools in South Africa regarding this issue, for instance, is simply that if they do not charge school fees there will not be enough money to keep the schools afloat.

The problem of poverty also means that learners have to attend school with empty stomachs, and their focus on learning as a result is badly affected. Feeding programmes are proving to be helpful in addressing the problem of hunger in a number of African countries. However, it is said that the future of these programmes, which are mainly supported by the World Food Programme (WFP), is uncertain due to, among other reasons, "...administrative and resource assistance from the WFP that cannot continue indefinitely."<sup>15</sup>

It should be stated, though, that education policies such as abolition of school fees and feeding programmes are not enough when parents have to bear other costs associated with education. As argued in the EFA-GMR2009, this will require more than education policies.

The future supply of teachers, job skills and researchers is in jeopardy in many countries. Nearly 78 million secondary school-age children are not enrolled in a secondary school in sub-Saharan Africa. In addition, transition rates from primary

to secondary school are low in most sub-Saharan countries.<sup>16</sup> These challenges highlight huge problems for the future of many countries, most especially in relation to human capital development.

The problem of out-of-school secondary-age children also reveals two other problems: a huge shortage of schools and classrooms;<sup>17</sup> and a lack of teachers.<sup>18</sup> McCullum and Ellis<sup>19</sup> highlight that not just teachers are needed, but qualified teachers, especially in the areas of maths and science. Lack of qualified teachers and facilities such as science laboratories, equipment or libraries, and under resourced class-rooms,<sup>20</sup> all contribute to yet another problem: poor quality of education.

What really needs to be done? More government and privately owned schools need to be constructed to meet the demands of UPE. School fees need to be abolished, even to the point of including a provision in the constitution of the African countries, as the Democratic Republic of Congo (DRC) has done. The recruitment, deployment and motivation of teachers need to be strengthened to ensure that there are enough qualified teachers in all regions and schools, especially in remote and underserved communities.<sup>21</sup> A correlation between the combination of construction of schools, increased teacher recruitment and the elimination of school fees, and high enrolment rates has been noticed in some countries.<sup>22</sup> This shows how important these aspects are for achieving UPE and EFA.

Furthermore, policies of governments should set high standards and encourage global competitiveness in education. For example, the continued existence and construction of schools that do not meet international standards and that are not equipped with world-class facilities and equipment should not be allowed.

In addition, because technology is progressing rapidly and is becoming indispensable, policies of governments need to adapt to this change by allowing technology into the classroom. IYA, for instance, intends to use online training tools to teach the topics of robotic optical and radio telescopes, webcams, digital universes (web and desktop planetariums), etc., which educators can use in their syllabuses. As stated in the EFA-GMR2009, improved access to good quality learning opportunities can strengthen economic growth by raising productivity, supporting innovation and facilitating the adoption of new technology.

In addition, more emphasis needs to be placed on secondary education because primary education only provides a foundation, whereas secondary education is crucial in supplying qualified teachers, job skills and future researchers.<sup>23</sup> This, together

with UPE, is very important in the long term, especially for science, which is currently experiencing a problem of lack of human capital.<sup>24</sup> IYA seeks to address this problem by attracting young people at all levels (that is at school and tertiary levels) to astronomy through astronomy activities that are meant to excite and amuse the public, and by training teachers to be effective in the classroom. Policies to ensure primary school learners remain up to secondary school level are, therefore, needed, with specific targets. They should include elimination of primary school-leaving examinations and making schooling compulsory.<sup>25</sup> Other measures may include creative assessment and examination methods that will encourage learners to remain up to senior secondary level.<sup>26</sup>

There are no doubts that governments know about these policies, but why are these things not happening? The interrelated nature of issues contributes immensely to the failure of most policies. An example is an issue of teacher-learner ratios that should be conducive to learning. If there are not enough classrooms it will be difficult to apply any policy with specific ratio requirements. If governments build no laboratories or supply no equipment, it does not make sense to talk about prioritising science. And, if there are no teachers or books, it does not make sense to make education compulsory, or to abolish school-fees if schools are not going to be left with enough money to run. This is right where the foot pinches. Firstly, governments should fund policy and invest more on infrastructure, human capital and equipment/materials if these problems are to be solved. Secondly, effective administration, communication, monitoring, support and capacity building should be supported to allow for the proper and accountable implementation of the new policies.<sup>27</sup>

Furthermore, it is important for governments to understand that global initiatives such as UPE and IYA can help give momentum to the development efforts, especially in African countries where sustainable development is most needed. Policies of governments and science policies, therefore, should be aligned with, and support, these initiative.

## Gender Equality and Women Development

Girls constitute the majority of learners (nearly 55%) who receive no schooling in Africa. In most cases, cultural responsibilities and bias are cited as the root causes for this problem.<sup>28</sup> Girls are more likely than boys to be required to stay at

home and look after sick parents, relatives or siblings, and to do domestic work. A UNESCO study has shown that in some countries such as Mali, girls from households affected by poverty are less likely to attend primary school than those from rich households.<sup>29</sup> In most cases, poor families faced with a choice of sending either a boy or a girl to school will choose a boy due to his likely future contribution to the family. Other problems include teenage pregnancy, early and forced marriages, and teacher attitudes towards girls, which are biased. A result of most or all of these problems is that only about 30% of African school-age girls attend secondary school.<sup>30</sup> This situation will prevent girls from growing into educated members of their societies to play positive roles in the education, political and economic sectors of their countries. And, as noted in the preceding section, this also means that there will not be a supply of female teachers, job skills and female researchers in the future. As some of these problems are related to poverty, poverty alleviation programmes, campaigns for increased social grants, and the collaboration between the education departments, social service departments and other relevant departments should be strengthened. Governments should develop well-defined targets for reducing disparities based on gender and other indicators of disadvantage, and monitor progress towards their achievement.<sup>31</sup>

As discussed in the preceding section, government and science policies should support and be aligned with those of global initiatives, such as USAID's Africa Education Initiative (AEI) and IYA. AEI supports many governments in Africa in taking girls to school, among other things. At the tertiary level, women remain under-represented in science and engineering, and 'over-represented' in areas such as education and health,<sup>32</sup> and IYA seeks to address this problem through its programmes directed to females. Through its 'She is an astronomer' and Ambassador Programmes that are meant to attract girls and female scientists,<sup>33</sup> IYA is also presenting an opportunity that governments should use to their advantage and to that of girls, to reach girls at all levels and to inspire them to go to school and remain there till they complete the school cycle, and then go to tertiary institutions where they can choose careers in science.

## Funding

For UPE, gender equality or any other development programme to succeed, funding is required. Increased funding will mean that more schools are

built, more teachers are hired, issues of school fees and feeding programmes are addressed, and subsequently UPE is achieved. As there are few teachers who are qualified to teach maths and science, it will mean that more teachers are trained to better teach maths and science, facilities such as laboratories are built, education standards are raised, and learners of high academic standards are produced. It will also mean that there is focus on science subjects, which is necessary for the alignment between science goals of education systems of governments and their national priorities and development goals. Supporting science, maths, engineering and technology at all levels will come with huge benefits, as people will be equipped with relevant knowledge and will be able to compete at knowledge level. Because economy in the 21st century is largely knowledge-driven, investing in knowledge and encouraging the creation of new knowledge in various institutions through funding will boost the economic performance of governments in Africa.

This dream will not be realised, however, nor will developmental priorities be met if the problem of the lack of human capital is not addressed. The New Partnership for Africa's Development (NEPAD) prioritised the areas of disaster management, food security, health, infrastructure, land use and water resource management as the areas that need serious attention by African governments. All these areas can best be monitored from space using remote sensing satellites.<sup>34</sup> Since there is a serious lack of human capital in space science in Africa to give enough focus on these areas, increased funding (at all levels, that is at school, tertiary levels and in research facilities) will mean that more young people are trained in space science technology and basic research, to address development challenges faced by the African countries. Furthermore, for the effective use of the Africa-owned satellites in addressing the stated priorities, NEPAD has forged a cooperation and partnership (the African Resource Management Satellite (ARMS) constellation) between Algeria, Nigeria and South Africa.<sup>35</sup> These three countries, together with Egypt, are the only African countries that have space programmes in terms of developing their own satellites and lofting them into space, and are leaders in Africa's space arena. They have prioritised the use of space for sustainable development in Africa, and have shown that space technology can address Africa's development needs, especially in the areas of resource management and food security (for example, prediction of locusts using remote sensing data), which is crucial at such a time when global food prices are sharply escalating.

Given the huge potential that Africa has to contributing significantly to science and development, as discussed, and also given all the challenges faced by African countries, as discussed, it is discouraging to note that research funding by governments in Africa is less than 1% of GDP. South Africa spends more on science development compared to other African countries. In the financial year 2007/8, it spent 0.95% of GDP, followed by Morocco at 0.8%. In roughly the same period, Algeria spent 0.5%, followed by Nigeria and Egypt at 0.4% and 0.2%, respectively. South Africa and Morocco are closer to reaching the target of 1%, a figure that is the African Union's policy target for 2010, for minimum allocation to Research and Development Science and Technology.<sup>36</sup> Other countries, however, are far from this target, which in itself is low when compared to that of developed countries. Finland, for example, with an economy the same size as South Africa, spends 3.5% of GDP.

There is, therefore, no doubt that substantial financial inputs and stronger political commitment are needed for African countries to reach the targets set by MDGs and EFA. One of the top policy recommendations from EFA-GMR2009 is to increase national education spending, especially in developing countries with poor investments in education, and to put equity at the centre of financing strategies, in order to reach disadvantaged populations.

## Conclusion

It has been shown that poverty, social inequalities and related problems can hinder progress towards education for all, and that global activities such as IYA are not enough to address challenges of UPE and gender parity. Policies for reducing poverty and inequalities, and for building infrastructure, should be revised and strengthened by governments if the MDGs and EFA goals are to be met. Clear targets for achieving these goals, backed by practical strategies for achieving more outcomes, need to be set. But all this is not enough without strong political commitment and sufficient financial commitment. Reevaluation of budget allocations to increase research and development contribution is paramount.

## Acknowledgements

Nceba Mhlahlo would like to thank Professor G. Ellis for his constructive comments.

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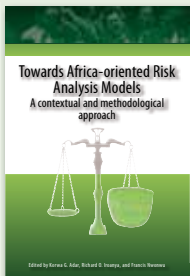
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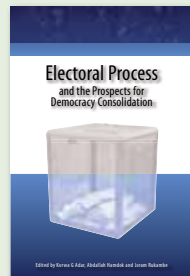
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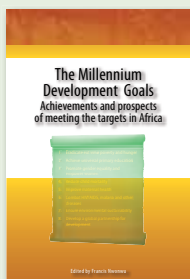
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