Committee: United Nations Environmental Programme (UNEP)

Issue: Water-Energy-Food: long-term strategies for resilience through the System Dynamics Modeling

Student Officer: Natasha Panagiotou

Position: Deputy President

Dear delegates,

My name is Natasha Panagiotou and I am a 10th grader at Anavryta Model High School. This year I will have the honor to serve as a Deputy President in UNEP of this year's ATSMUN. This conference will be my fifth chairing experience and my 11th conference overall.

I need to congratulate you for your decision to get involved in the MUN world and I hope you enjoy it as much as I do. In this study guide, we will focus on the second topic of the agenda of UNEP, namely Water-Energy-Food: long-term strategies for resilience through the System Dynamics Modeling. This study guide will provide you with some basic knowledge and information upon the issue and explain the important aspects of the matter. However, you are advised to do further research on your country's policy and involvement in the matter, so as to be fully prepared for the conference.

My email address is natpanag07@gmail.com. Do not hesitate to contact me about anything regarding our committee. I am looking forward to meeting you.

Best regards,

Natasha Panagiotou

INTRODUCTION

The provision of water, nutrition and sustainable energy to the whole globe and especially Less Economically Developed Countries has been proven a challenge that many scientists and world organizations have been called to tackle. Setting the Sustainable Development Goals was the first step to recognizing the problem and trying to encourage all the nations- at least the 193 ones that signed the agreement- to take action and reach the goals set until 2030. With the development of technology and high-tech computing and modeling systems, such as the System Dynamics Modelling, there are better chances of having enough water, food and energy supplies for all. System Dynamics Modelling gives the opportunity to test new strategies artificially so as to prevent any negative effects on the actual implementation. Furthermore, it manages feedback rapidly and efficiently and by that it helps with acting correctly and aiming for a better outcome and better distribution of the supplies. What we should focus on, though, is finding possible ways and long-term strategies that will facilitate the complete change to renewable energy and most importantly ensure that the whole population of the world has safe access to clean water and endless clean nutrition. The United Nations will be the primal body which should try to tackle the issue since the matter is a serious obstacle to achieving the SDGs set by the UN and the UN is responsible for ensuring safe access to energy food and water since many LEDCs rely on the UN to cover those survival needs.

DEFINITION OF KEY TERMS

System Dynamics Modeling

"System Dynamics Modelling (SDM) is a methodology for studying and managing complex feedback systems. It is typically used when formal analytical models do not exist, but where system simulation can be developed by linking a number of feedback mechanisms."[1]

[1] https://emps.exeter.ac.uk/media/universityofexeter/emps/research/cws/downloads/LVL-SDM-Kremikovtzi_Flyer_FINAL.pdf

Sustainable energy

"Sustainable energy is energy that we will never use up or deplete. It is inexhaustible."[2] Some forms of sustainable energy are wind, solar and water as well as bioenergy and geothermal energy.

Nexus

"An important connection between the parts of a system or a group of things"[3]

Sustainability

"The quality of causing little or no damage to the environment and therefore able to continue for a long time."[4]

Resilience

"The quality of being able to return quickly to a previous good condition after problems."[5]

BACKGROUND INFORMATION

The problem with water and food and energy supply and its effect

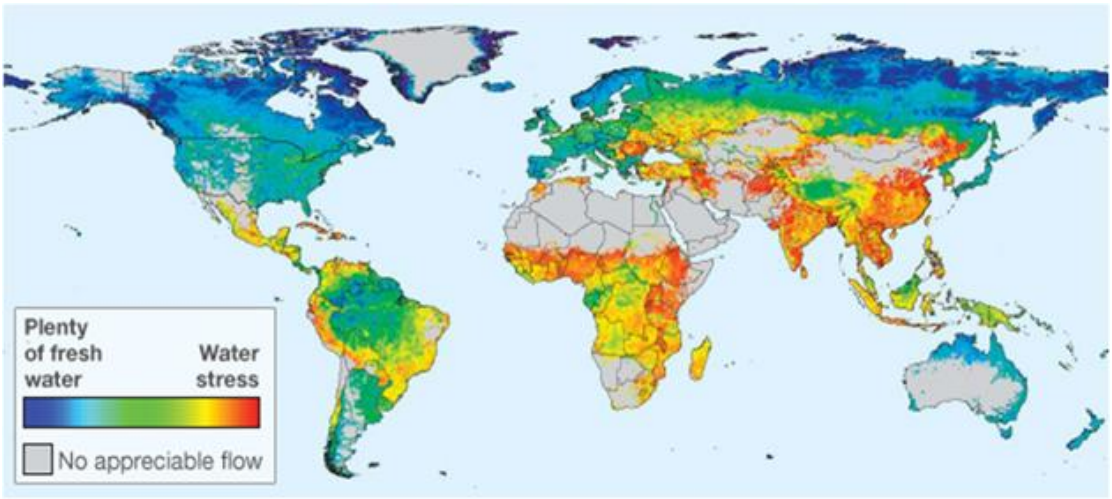
The last years, water scarcity and food supplies are beginning to be limited and many regions face serious problems.

Water Scarcity

Water covers 70% of our planet but fresh water, appropriate for consuming is only 3%. This seems odd but the situation is even worse considering the fact that 66% of the fresh water is in frozen glaciers, so it cannot be obtained. As a result, 1.1 billion people worldwide lack access to water and 2.7 billion find water scarce for only a month of the year. Inadequate sanitation is also a problem for 2.4 billion people exposed to diseases, such as cholera and typhoid fever, and other water-borne illnesses and two million people, mostly children, die each year from diarrheal diseases alone.[6] The ecosystems are in danger as water systems, rivers, lakes, aquifers

[2] https://alcse.org/energy-alabama/our-work/education/what-is-sustainable-energy/#:~:text=Sustainable%20energy%20is%20energy%20that%20we%20will%20never%20use%20up,also%20bioenergy%20and%20geothermal%20energy.
[3] https://dictionary.cambridge.org/dictionary/english/nexus
[4] https://dictionary.cambridge.org/dictionary/english/sustainability
[5] https://dictionary.cambridge.org/dictionary/english/resilience
[6] https://www.worldwildlife.org/threats/water-scarcity

that preserve them are drying up or they are extremely polluted. Climate change has a huge impact on water scarcity because of the sudden changes in weather and water around the world resulting in droughts in some places and floods elsewhere. It is expected for the situation to worsen and by 2025, two-thirds of the world's population may face water shortages.[7]



Water shortages around the world

Drought

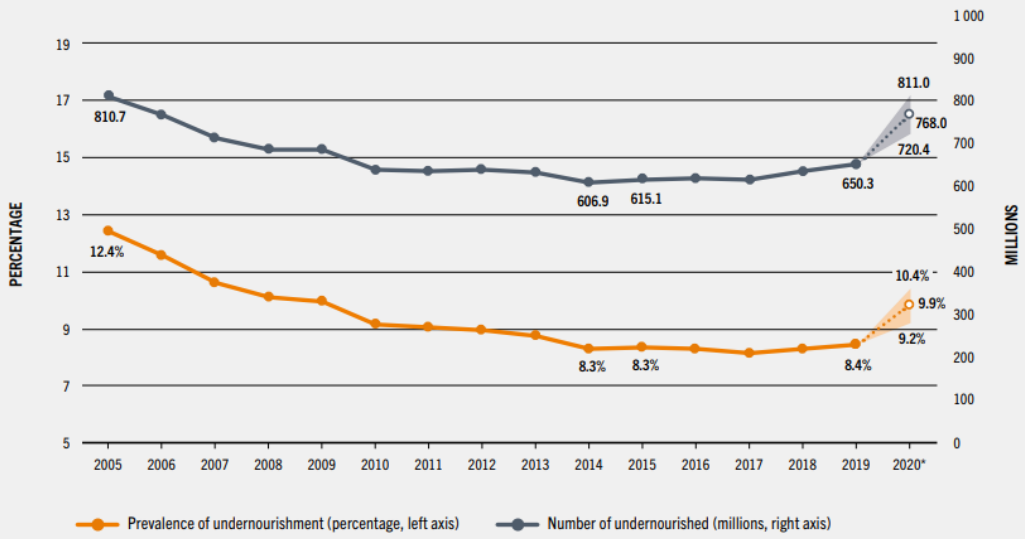
Food Supplies

In 2008, the world was facing a food crisis. The problem was the availability of the products and there was not enough nutrition for all. Nowadays, the food crisis we are facing is based on the access to nutrition. Due to COVID-19, even if the

[7] https://www.worldwildlife.org/threats/water-scarcity

products where produced, they would not reach the market. Thus, the issue was that the food supplies could not reach the consumer and it was left to the producers. Another aspect of today's food crisis are the high prices of food. That problem started as the demand of products was rising and now the Ukrainian war is making the situation worse. Even if the war is not the only problem, it has played a significant role. The issue is in availability and transportation of the products. For example, together Ukraine and Russia produce 15% of the world's wheat but 30% of world wheat exports and 60% of the world's sunflower oil. Also, many products were transferred to world markets through the Black See and through Russia and Ukraine. It is important to be able to store food supplies locally so as to prevent those issues. But the crisis in the world market it is not the only problem concerning nutrition. The long-lasting problem of hunger especially in LEDCs is still prominent. Current estimates show that nearly 690 million people are hungry, or 8.9 percent of the world population – up by 10 million people in one year and by nearly 60 million in five years.[8] These problems will only get worse if we do not take stricter measures against it.

FIGURE 1 THE NUMBER OF UNDERNOURISHED PEOPLE IN THE WORLD CONTINUED TO RISE IN 2020. BETWEEN 720 AND 811 MILLION PEOPLE IN THE WORLD FACED HUNGER IN 2020. CONSIDERING THE MIDDLE OF THE PROJECTED RANGE (768 MILLION), 118 MILLION MORE PEOPLE WERE FACING HUNGER IN 2020 THAN IN 2019 – OR AS MANY AS 161 MILLION, CONSIDERING THE UPPER BOUND OF THE RANGE



The number of undernourished people during the years[9]

Energy Crisis and Sustainability

[8] https://www.un.org/sustainabledevelopment/hunger/
[9] https://www.fao.org/publications/sofi/en/

The energy crisis is taken over our everyday lives as it affects many aspects of our lives. The energy crisis is the concern that the world's demands on the limited natural resources that are used to power industrial society are diminishing as the demand rises. Energy is coming from natural resources and but there are not unlimited and it can take more hundreds of thousands of years to restore. The turn to renewable resources is a priority and nations are working together to make it happen. Until this step is completed, it is important to conserve and use responsibly the non-renewable resources. The energy crisis is something real and it is not only about the rising prices of gas but it affects the environment and our future. Overconsumption and overpopulation have raised demand which the poor infrastructure cannot deal with resulting to limited resources. Furthermore, a lot of energy is wasted so it is necessary explore more renewable energy options that can be used. In addition, environmental incidents and conflicts make the problem worse and more difficult to reach sustainability. The energy crisis affects the environment and pollutes the planet. It causes political conflict because of the access and prices of the energy supplies. All nations should work together to reduce the impact of overuse of energy resources.

Sustainable Development Goals about the issue (SDG 2,6,7)

It is a fact that some parts of the world suffer from things that the population of MEDCs and developed countries take for granted. For that reason, the Sustainable Development Goals (SDGs) were adopted by the member-states of the United Nations in September 2015. These goals were set so as to improve the circumstances under people survive and live. The goals need to be achieved until 2030 so as to prevent further damage on the planet and the well-being of the population. What is important for our topic is focusing on the achievement of the second, sixth and seventh SDG. The second Sustainable Development Goal is about zero hunger. It calls for food security and improved nutrition as well as the promotion of sustainable agriculture.[10] If this goal is achieved, the food crisis that the whole population is facing now can be resolved and the deaths because of hunger will be eliminated. The sixth sustainable development goal is about ensuring availability and sustainable management of water and sanitation for everyone.[11] There has been a lot of progress on providing sanitation and access to clean water even to countries where it is

[10] https://sdgs.un.org/goals/goal2
[11] https://sdgs.un.org/goals/goal6

difficult to find water sources. The problem, though, still remains and it needs to be tackled before the illnesses caused by polluted water infect more people. The seventh goal is also important for our issue. The energy problem which is the main focus of this goal is mostly an issue for developed countries as the consumption of energy is high but it can also be an issue of developing countries due to the lack of electricity in some regions. Namely, the SDG 7 says "ensure access to affordable, reliable, sustainable and modern energy for all".[12] This should be achieved before it is too late.

The 17 Sustainable Development Goals

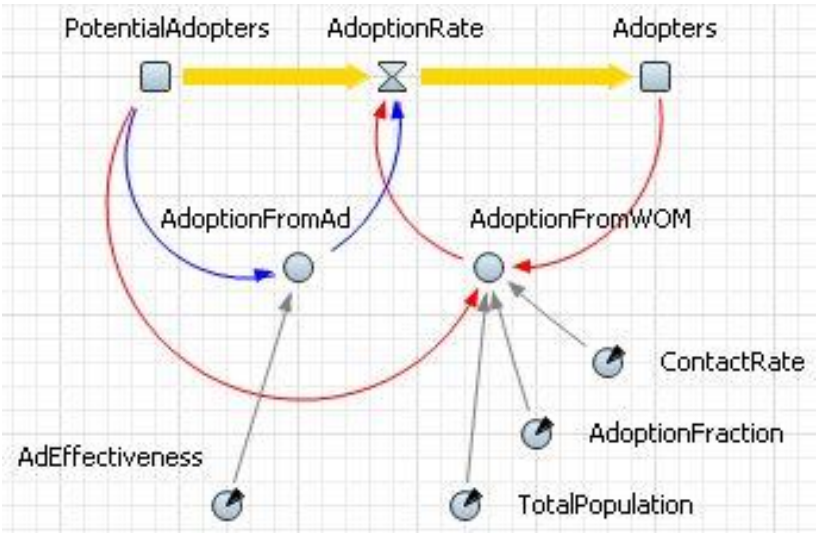
System Dynamics Modeling

The way of operation of System Dynamics Modeling

Normal modeling systems are based on a causes and effects model and they require long term observation and time delay may be a problem. System Dynamics Modeling operates differently. It helps people make better decisions when they face complex systems. For example, system dynamics models help with constructing formal computer simulations of complex systems which can be used by businesses to create feasible and more effective policies and plan of actions. It shows the statistics in feedback loops and in stocks which helps with organizing the data and making better predictions. What is worth mentioning is that system dynamics models do not consider a single event but takes into consideration all the aspects and the complete

[12] https://sdgs.un.org/goals/goal7

view of an issue. The system dynamics works with aggregates and global data and policies. It operates with a specific program of software that includes mathematic and statistic programs and solves various equations to provide model maps.



Example of feedback loop

How can the System Dynamics Modeling help

Systems Dynamics Modeling is a powerful tool in our hands. The models made by the system can be used to prevent waste and track production and use of energy, food, and water. Moreover, this system is used to help taking decision by understanding and predicting the dynamic behavior of complex systems in support the development of effective policy actions.[13] Furthermore, we can provide feedback from countries that face crisis and take back diagrams from the dynamics modeling system to pinpoint the cause of the problem and the area of improvement. The system can also be used for measuring pollution rates in different seasons and areas of the world. The statistic models made by the system can be used in many fields and help with tackling the issue more effectively by working directly at the root of the problem and not wasting resources and funds.

[13] https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-018-5318-8

MAJOR COUNTRIES AND ORGANISATIONS INVOLVED

Finland

Finland is one of the top countries in sustainability and innovations for the protection of the environment. The country hosts programs which focus on water, food as well as energy security. There are special teams that look into this issue as it is believed that security of supplies and the use of sustainable renewable energy are important for the stability of the country.

The Netherlands

The Netherlands recognizes the food, water and energy crisis. There has been research conducted on the matter and specifically the aim was to provide efficient and valid evidence that there are possible risks and vulnerabilities on the security of water, energy and nutrition. It was shown that we need to understand that these problems pose a threat to the global level and the global demand needs to be monitored so as to recognize the needs of the population and focus on areas that are most probable to face insecurities.

The United States

Water, energy and food (WEF) are leading the economic and social sustainability of the world as well as the United States. The security of WEF is stabilizing the economy and the country and trying to achieve this security urges new scientific solutions and societal changes. The United States Geological Survey (USGS) in close collaboration with the US government conduct researches and surveys for this goal. Especially, the USGS supports specific mission areas who try to research sustainability and improve their local society. The United States use the WEF and its connection with national sustainability as a strategic role in the evolvement and future of the States. As demand for WEF resources grows due to human activities, pressure is put on environmental health, water supply and the preservation of the ecosystem which will eventually lead to further USGS missions. In general, the US are facing difficulties with the WEF security but they are combating it effectively.

Food and Agriculture Organization (FAO)

The Food and Agriculture Organization is working on the WEF Nexus but it mainly focuses on the nexus approach for water energy and agricultural management. It also works for the recognition and tackling of the environmental impact of this approach. What has the FAO that is concerning is that there is not one approach to all the different factors of the nexus something that can lead to conflicts of interest between sectors relying on the same set of

resources. The FAO is responsible for the achievement of many of the SDGs concerning the agriculture and the environment and the collaboration of the FAO with other international organizations is very probable.

United Nations Educational, Scientific and Cultural Organization (UNESCO)

UNESCO has contributed on the research made for the application of the Modeling System, especially on the collection of data for the water and food nexus. UNESCO funds and hosts many projects yearly and one that was hosted the past years was about WEF security and the approach to the issue. A report was filled explaining what the energy, food and water crisis is, its causes and effects and how we contribute to the problem. There was no further action on the matter but UNESCO should be part of the discussions made on this topic as it can help with finding possible approaches in the near future.

World Bank

The World Bank has closely watched the issue and have fill various reports on the food and energy crisis. The World Bank has assigned to specific scientists to document the development of the food crisis and energy crisis and reporting the impact that the war and the pandemic have on the food chain and to the prices of all goods and gas as well as the trouble that is caused to the routes that were previously used for their transfer. The World Bank has provided a better insight to the problem with statistics and models concerning the Water-Energy-Food Nexus (WEFN).

TIMELINE OF EVENTS

Date	Description of Event
2007	There was a world food and economic crisis declared by the UN and the World Bank
2008	The food shortages increased and the first food crisis was supposed to have come to an end
June 2009	The United Nations' Food and Agriculture Organization (FAO) reported the number of people suffering from hunger around the world had reached one billion

25 September 2015	The United Nations General Assembly adopted the resolution 70/1 for the set of SDGs
November 2019	The first case of COVID-19 was detected in China leading to a pandemic
2020	A new food crisis was declared by the FAO
24 February 2021	Russia invaded Ukraine declaring the ongoing war
December 2021	FAO-WFP presented at the United Nations Security Council (UNSC) about monitoring food security in countries with conflict situations[14]
July 2022	Paths for transferring goods and cereal from Ukraine to third world countries, so as to prevent extreme hunger, were opened by Russia

UN INVOLVEMENT: RELEVANT RESOLUTIONS, TREATIES AND EVENTS

- United Nations General Assembly Resolution 70/1: https://sustainabledevelopment.un.org/index.php?page=view&type=111&nr=8496&menu=35

  This resolution was adopted by the UNGA on 25th September 2015 on the topic of "Transforming our World: the 2030 Agenda for Sustainable Development". The resolution sets 17 Sustainable Development Goals aiming to zero poverty and hunger, protection of human rights, the protection of our planet and peace.

PREVIOUS ATTEMPTS TO SOLVE THE ISSUE

Sustainable Development Goals

The Sustainable Development Goals (SDGs) were set by the United Nations in 2015 and are supposed to be achieved by the year 2030. The main reason of these goals was the protection of our planet and the turn to a more sustainable and less pollutant way of living.

Collection of Data

International organizations were recommended to collect data from different parts of the world so as to compare the feedback from each nation and recognize the most common

[14] http://www.fightfoodcrises.net/timeline/en/

problems concerning food, water and energy supplies. Various reports and statistics were conducted with this aim. These data are now used by the System Dynamics Modeling and other similar software systems to prevent destructive act from happening again and decreasing the chances of another crisis taking place.

POSSIBLE SOLUTIONS

Collecting data in a database

Databases have been created within the United Nations, with the help of the United Nations Statistical Commission (UNSD) for various issues. The creation of a new database for the collection of data and information gathered by member-states is necessary. The feedback on the matter of water, food and energy security should be filtered and the necessary data should be used by the Systems Dynamics Modeling.

Raising awareness for the importance of SDGs

Providing the general population with valid and correct information by reliable sources can give them a better insight on the crisis that our planet is facing. The achievement of the Sustainable Development Goals cannot be achieved without the contribution of the people of each nation. Everyone should be educated about how we can help our planet and achieve these goals. The raise of awareness can be achieved through campaigns with this goal as well as special UN and government-funded programs organized by specialists on the matter.

A UN body for tracking the progress towards sustainability

The UN is the main organ that should be responsible for the way towards a more sustainable future. A mission or a body operating under the United Nations should be responsible for reporting and documenting the progress of each member-state of the UN to the Secretary General so as to provide them with a complete description of how the problem is impacting our world, what other issues have occurred and what innovations were made that helped solve an aspect of the problem. It is important that this body works with the UNSD so as to have access to valid data. The UN should be the one to guide the rest of the governments on the way to sustainability and this body can be also responsible for this cooperation.

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