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New International Migration Management Technologies and Their Impact on Sustainability

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Definitions

International migration management refers to the development and implementation of policies, programs, legislative measures, developmental projects, and performance of international and state actors (e.g., border agencies, immigration services, international organizations) related to international migration procedures and services, border control, migrant protection (e.g., counter-trafficking, protection of rights of migrants, and their families) as well as cross-border labor mobility.

Algorithm is a sequence of machine-readable commands aiming at performing a certain task, e.g., prioritization, classification, or clustering visa applications.

Artificial Intelligence is algorithmic technology that takes actions with some degree of autonomy based on the complex relations between input data (new, unseen data) and historical data.

Sustainability, Migration and AI – Connecting the Dots

Contrary to conventional wisdom, globalization and technological progress have not resulted in a significant increase in international migration. Although international migrant stock has been growing in absolute numbers since the 1960s, the share of migrants in the world's population has been continuously fluctuating around 3% (Migali et al. 2018). In 2019, there were 272 million migrants worldwide (ca. 3.5% of the world's population) (UN DESA 2019). What has changed, however, is human mobility, directions of migratory flows, and reasons for leaving country of origin. Technological progress has significantly reduced costs of migration leading to the increase in intercontinental movements (Grubanov-Boskovic and Kalantaryan 2018). The directions of migration are also changing, with only one of the ten most popular migration corridors from 1965 remaining today (from Mexico to the USA) (Grubanov-Boskovic and Kalantaryan 2018; Abel 2018). Although migration was always and is still driven by inequalities of economic, political, and social nature, there is a rapidly growing number of environmental migrants due to climate change, loss of biodiversity, and land degradation in low-developed regions urbanization appears to be one of the drivers of displacement while also itself contributing to environmental change (temperature increase, changes in land use, hear emissions)

W. Leal Filho et al. (eds.), *Reduced Inequalities*, Encyclopedia of the UN Sustainable Development Goals,
https://doi.org/10.1007/978-3-319-71060-0_120-1

(Přívara and Přívarova 2019). Many countries around the world struggle how to sustainable address big numbers of refugees, IDPs, or forced migrants. States tend to react to mass migration with short-term and reactive responses, such as creating border camps or shelter for a limited time. In many contexts, however, large waves of migrants will not be able to return to their home country and requires a long-term strategy. A sustainable approach would aim at enabling the migrants to support themselves and develop self-sustaining livelihoods, as well as support the local host community, for example local food production (Al-Husband and Adams 2016). It comes as no surprise, then, that various aspects of migration were incorporated into the 2030 Agenda for Sustainable Development, in particular Target 10.7 that aims to "facilitate orderly, safe, regular and responsible migration and mobility of people, including through the implementation of planned and well-managed migration policies."

Although the notion of migration management has been for the first time elaborated in 1993 and explicitly recognized in the global development policy only in the 2030 Agenda, this concept has a much longer history (Geiger and Pécoud 2010; Klein Solomon and Sheldon 2018). At least since 1900s certain governments have been gradually adopting various admission criteria for migrants, such as assured employment (Canada), national quotas (Brazil, Canada, South Africa, and United States), or having sufficient financial resources (Argentina) (Ferrie and Hatton 2013). Increased migration to the developed countries with relatively small populations led to the rise of demand-driven migratory policies and adoption of sophisticated migration control measures since mid-1980s (Pijnenburg et al. 2018). In 1967, Canada introduced a points-based systems that prioritized highly-skilled migrants. Similar systems were deployed in Australia (1979) and New Zealand (1991). In other countries, migration policies introduced multiple visa categories that prioritize certain profile of migrants (e.g., South Korea) (Chung 2019). Such systems make it more difficult for persons coming from disadvantaged communities to migrate, which can lead to reinforcement of inequalities.

In this context, governments are increasingly using new technologies, such as Artificial Intelligence (AI) systems, in international migration management (Beduschi 2020). AI-based migration management systems were already deployed in the EU (FRA 2018) Canada (Molnar and Gill 2018), New Zealand (Stats 2018), the Netherlands (Dekkers et al. 2019), and United Kingdom (UK Parliament 2019). Although these systems differ between themselves substantially, they are based on algorithms which are involved in the process of granting someone a visa, identifying and allowing the entrance into a country at the border or deciding on resettlement locations. As automated systems take into account vast amount of data and perform numerous computations, it is frequently impossible to recreate the decision-making process, which is referred to as a "black box problem" (Castelvecchi 2016). This means that international migrants might be unable to successfully challenge the decision of immigration system, even if the decisions are discriminatory.

For this reason, the unregulated use of AI systems might in fact hamper achievement of SDG 10.7 and lead to increasing inequalities between various communities within and among countries. In addition, biased or low-quality AI solutions might negatively impact progress toward other goals, in particular achieving gender equality (SDG 5), promotion of full and productive employment (SDG 8) and development of inclusive human cities and settlements (SDG 11). AI can be also utilized to prevent and mitigate sudden natural disasters as well as long-term consequences of climate change. For example, AI management tools can lead to a more sustainable use of water (SDG 6), in particular because of its ability to constantly adapt and process large amounts of data in real-time. AI solutions have also been employed in agriculture (SDG 2, SDG 12), for example in a project attempting to diagnose plant disease by using an app: farmers can use their smart phones in the field to identify diseases. At the same time, the project would allow to identify patterns and make predictions (Goralski and Tan 2020).

Further parts of the chapter will be dedicated to the detailed analysis of three major challenges in

ensuring that the use of AI systems in international migration management remains in line with the 2030 Agenda for Sustainable Development. First of all, deployment of technologically advanced solutions requires solid **legal framework** that provides adequate protection of migrants' rights, in particular right to nondiscrimination. Secondly, development of AI systems is not solely a technical endeavor but also an **ethical challenge**. For this reason AI-related migration projects should build upon the most current ethical research and incorporate the voice of migrants themselves ensuring that it does not reinforce inequalities. Last but not least, implementation of algorithm-based systems should ensure the **highest standards of technical robustness**, i.e., security, accuracy, reliability, traceability and, most importantly, high quality of data used for algorithm training. Those three challenges mirror the three components identified by the EU High-Level Expert Group on Artificial Intelligence as forming trustworthy AI: lawfulness, ethical and robust. In the following parts, the *Ethics Guidelines for Trustworthy AI* (further EU Ethics Guidelines) serve as a basis for the analysis of challenges posed by the AI systems in migration management. The EU Ethics Guidelines are the most advanced document of this kind, while the EU is the most active international organization in the global landscape of regulating AI (Jobin et al. 2019), which makes the document a good beginning for an analysis. At the same time, the analysis incorporates standards developed within the Council of Europe and UNESCO, as well as latest domestic developments.

Challenges in Harnessing Technology for International Migration Management

Lawfulness

Human rights need to be a basis for trustworthy AI. While the EU Ethics Guidelines do not deal specifically with migrants and migration managements, they do highlight that also third-country nationals and persons who entered irregularly have rights under international law that need to be respected (AI HLEG 2019). By accepting international human rights law treaties, states oblige themselves to ensure human rights to all persons within their jurisdiction. This includes also the principle of nondiscrimination, which is particularly prone to be violated in the context of AI systems of migration management. In the same vein the SDG 10.2 aims at "empowering and promotion of social inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status," with the overall aim to reduce inequalities both within and among countries. The performance of algorithms relies on datasets and computational techniques that, both in their design and implementation may introduce bias and thus produce discriminatory effects or human rights infringements (FRA 2019; Caliskan et al. 2017; Danks and London 2017; Costello and Mann 2020). For instance, the algorithm-based visa entry system deployed in the United Kingdom was ruled unlawful in 2005 due to the bias and discrimination against Roma population and in 2020 the Home Office agreed to scrap its "visa streaming" algorithm, due to the "racist assumptions" of the system (McDonald 2020). While every AI system carries risks to human rights, these are particularly significant in migration management, due to the fact that the process produces serious consequences while persons taking part in it do not have the possibility to opt out.

In order to limit potential discriminatory practices the process needs to ensure transparency and explainability. States should not only reveal content (transparency), but also explain to the person using the AI system why such a decision has been taken (explainability). In the context of lawfulness, that means that as much of the technological aspects (scoring boards, algorithms, source codes) as possible need to be made transparent. Even in traditional systems, the process of granting a visa tends to be opaque, and it is very difficult to prove if applications are rejected on discriminatory grounds (Costello and Mann 2020), which can be aggravated by using algorithms. Some authors indicate that the deployment of AI poses a danger of so-called proxy discrimination which is particularly difficult to detect. This is due to the fact that

algorithms fueled by the vast amount of data might replace information on gender or race by using a combination of seemingly extraneous co-occurrences and, therefore, making it difficult to detect by a human (Prince and Schwarcz 2019). In this context, discriminatory algorithms may significantly impede achieving SDG 8 (decent work and economic growth), in particular target 8.8 which relates to protection of labor rights for all workers, including migrant workers.

Preventing and responding to discrimination in the context of AI requires the *explainability* of algorithms, meaning that information about the logic involved and the consequences of the processing need to be made clear. The aim is to make it possible for the applicant to understand how the decisions are being made. This has also implications on choosing the means and methods, for example, when the same or very similar performance is provided by two algorithms, the simpler one should be prioritized. In government-to-individual relationships, such as migration-related procedures, the explainability requirements should be particularly strong to ensure trust between public authorities and citizens. Attributing fairness to state decisions facilitates implementation of public policies oriented towards sustainable development, in particular acceptance for measures intended to protect the environment at the cost of economic growth (Poelzer and Yu 2020).

As full transparency of AI system of migration management is neither possible nor desirable, states need to carefully consider which information should be made public. AI systems used in migration management are often created or co-created by private companies, institutionalized accountability requires undertaking comprehensive actions aimed at different actors (Molnar and Gill 2018). Independent authorities should assess the algorithms, data and design process. Additionally, access to complaint mechanisms needs to be provided. As not all information will be publicly available, judicial review of algorithmic decisions and accountability of migration agencies has to be guaranteed, to ensure that the AI systems are in fact not discriminatory or in other ways violating human rights. Judicial review has proven to be key in holding AI systems accountable. For example, in 2015 the Federal Court of Canada found that denying refugee claimants coming from countries which have been categorized as a safe country by an algorithm the right to appeal was unconstitutional (Canada Federal Court 2015). Another example comes from the US, where in 2020, a noncitizen placed in an immigration detention facility challenged the so-called No-Release-Policy introduced under Trump administration. The policy is being enforced, among others, via algorithmic system operated by the U.S. Immigration and Customs Enforcement – changes implemented into the algorithm in mid-2017 resulted in significant increase of bond or release denial (from 53% in 2013–2017 up to 97% in 2017–2019) (S.D.N.Y. Court 2020). The case remained ongoing as of submission of this chapter. In the Netherlands, on the other hand, the Hague District Court decided that an algorithm-based system SyRI violates right to privacy and family life. The system had been used by the Dutch authorities to detect welfare frauds, allowances and tax frauds. As SyRI was deployed only in areas with low socio-economic status, its performance was reinforcing existing prejudices and inequalities against certain groups such as immigrants (Hague District Court 2020).

Ethics

Using AI system in migration managements creates also specific ethical challenges which should be considered and addressed. As pointed out by the CoE declaration on manipulative capabilities of algorithmic processes from 2019, such system bear the risks of reinforcing social, cultural, religious, legal, and economic segregation and discrimination, as well as micro-targeting (Council of Europe 2019). Thus, there is a risk that using such systems will lead to increasing inequalities, and hamper the achievement of SDG 10. Similarly, the EU Ethics Guidelines also specifically point to the fact that states should pay particular attention to more vulnerable groups and to situations which are characteristic by asymmetries of power (AI HLEG 2019). Those risks are clearly highly relevant in migration contexts. To address

the ethical challenges faced potentially by AI systems in migration management, ethical principles need to be adhered, in particular respect for human autonomy, prevention of harm, fairness and transparency and explainability.

While AI systems can help to come up with plausible casual mechanisms based on datasets, they can also suggest causal relations when there are none. Wrongfully identified cause-and-effect relationship between certain variables might misguide AI-based decisions in refugee resettlement procedures, where data analysis determines where the particular refugee would be most likely to acclimate or achieve economic success (Bansak et al. 2018). In two simulations conducted on historical data on refugee populations in the US and Switzerland, algorithmic assignment was found to increase employment outcomes by approximately 40–70% on average (Bansak et al. 2018). However, if the AI system mistakes correlation with causality, this can lead to resettling to places on a wrong premise. Considering ethical aspects in designing AI serves also to catch such possible confusion and correct them during the functioning of the system.

AI systems are created by researchers, engineers and entrepreneurs. Additional effort needs to be taken to ensure that ethics is considered at every stage of designing AI systems. Several steps can be taken to ensure that. Awareness of ethical issues involved in the development of digital technology can be included from the very start of training (engineering school syllabuses, university IT courses etc.) (Villani 2018). Development of new AI applications that are involved in decision-making concerning individuals can be subject to the assessment of ethical review boards. In addition, before being deployed at large scale, AI systems should be launched as pilot projects allowing for a comprehensive performance assessment. In fact, every single algorithm applied in decision-making process is a controlled experiment which performance should be empirically verified and, as such, require rigorous experimental design. With regard to AI systems employed in migration management, including migration specialists, or migrants themselves, will make it possible to shed light on additional issues that could have been overlooked by engineers or policymakers (e.g., proxy discrimination). Also, broader public debates on the permissible and unacceptable usage of algorithm can facilitate their more ethical design and application. The debates on the AI system should be open-ended, informed and inclusive, and with regard to migration management specifically, include those, that are affected by the policies – migrants themselves. Ethics should also be included among the factors of the system that are regularly audited, which will not only allow for identifying when the feature is not enough highlighted, but also force authorities commissioning AI systems, to include ethical issues in the design.

Technical Robustness

Legal and ethical considerations are ultimately translated into technical solutions. Deployment of an AI system in a dynamically changing environment (e.g., border infrastructure or migration-related administrative procedures) requires careful design and engineering to avoid unintended consequences. In fact, one of the major advantages of algorithms in international migration management is their adaptability to sudden and unexpected increases of migration, for example, movements caused by natural disasters or financial crises in neighboring countries. Predictive analytics can be an enabler for replacing an *ad hoc* crisis-driven approach to unexpected migration (e.g., EU-Turkey Refugee Agreement) with an approach focusing on long-term sustainability.

Achieving adaptability requires continuous inflow of high-quality data. This is due to the fact that the power of AI lies in its computational power that allows for merging heterogenous data and identifying complex patterns which could not have been discovered by a human. Algorithmic systems in international migration management are fueled with vast amount of information from a variety of sources, including border security agencies, law enforcement, health records open sources (in particular geospatial data), international organizations (e.g., Migration Data Portal managed by IOM's Global Migration Data Analysis Centre) and private companies (e.g., social

media). In this context, the performance of migration management systems depends on the sustainability of data supply chains (Papadopoulos et al. 2016).

In their developmental phase, AI systems are "trained" to identify certain patters on so-called training dataset and subsequently tested on another, unseen dataset. Only when its performance remains satisfying, an AI system is being deployed. Although numerous factors influence the overall performance of AI, arguably the most important one is the quality of data used therein. Existing evidence indicate, however, that the quality of administrative records in migration remains questionable and many countries have limited capacity to properly collect and process digital data (Schumacher et al. 2019). Differences between information recorded in immigrant register and findings of independent surveys suggest, on the other hand, that administrative records tend to include biased data on certain features such as education prior to immigration (Careja and Bevelander 2018). In addition, migrants may be reluctant to share some information which is, nevertheless, used by an AI system. Similarly, environmental datasets used across science and industry might include systematic biases such as non-random observations (biased, for instance, by weather or human population) (Kosmala et al. 2016). Inclusion of low quality data in AI systems can lead to undesired consequences, hampering the achievement of SDGs. Additional challenges arise from the processing of unstructured data such as social media content. Algorithms can underperform in certain languages while users' motivations to post or share certain content may not be easily reduced to pre-defined categories or variables. Algorithms for social media screening for immigration purposes have been tested in the United States and initial results prompted the Department of Homeland Security to "*take prudent steps to improve the functioning (. . .) and execution of its social media screening pilots*" (DHS 2017).

Due to the complexity of datasets and machine learning algorithms used therein, AI systems are particularly vulnerable to attacks and manipulation. For this reason, developers of AI should adopt a "security-by-design" approach ensuring that applications are properly protected against common threats. One of the greatest challenges is to ensure security of data exchange between various institutions. Unlike traditional software, most of the AI solutions require constant flow of data to adapt and learn from new experience and patterns. In the context of migration, these frequently include highly sensitive data such as biometric data (e.g., iris scans, facial images, or fingerprint data) as well as personal data related to identity, migratory status, medical or police records. Data migration across the institutions poses, therefore, a risk of data breach or identity theft. For example, a massive data breach has in 2020 forced Australian authorities to take down SkillsSelect app that had been used for ranking applicants in immigration procedures (Karp 2020). Guardian Australia revealed that personal details of 774,000 migrants could have been revealed.

AI systems in migration management are widely applied to the classification of visa applications (Wizman 2020). Typically, applications are divided into three categories, namely: positive decisions, negative decisions and borderline cases. The latter two are usually subject to human intervention, meaning that immigration officer verifies the application before the decision is taken. Classification systems are based on identifying similarities between certain features (criteria) that could be either indicated by a human or detected automatically by an algorithm. Their accuracy is measured with the share of positively classified cases and depends on the quality of "training data." Nevertheless, it is always a human that sets up the accuracy threshold, namely, the minimum accuracy parameters. Face recognition systems typically yields very high levels of accuracy (accepting only 1 false in 10,000 cases), however performance of an algorithm might significantly differ if applied against certain groups, for instance East Asian and Caucasian faces (Cavazos et al. 2020). Therefore, the development of AI systems in migration management should integrate various approaches to ensure maximum accuracy levels, for instance by the deployment of the most advanced

algorithms, combining machine-made decisions with human judgements (Jonathon Phillips et al. 2018) or providing immigration officers with probability scores instead of binary decisions. Otherwise, algorithmic systems may reinforce existing or create new inequalities based on the complex patterns identified in datasets.

Ensuring reproducibility is essential to guarantee that AI systems exhibits the same behavior when repeated under the same conditions (AI HLEG 2019). Reproducibility makes technology more reliable and predictable for an individual and, therefore, contributes to achieving greater social acceptance for the deployment of data-driven solutions by state authorities. At the same time, reproducibility allows engineers and policymakers to better understand the logic which underpins AI systems and to adapt their performance to meet targets and goals of the Agenda 2030. Although AI applications are frequently criticized for being "black boxes" that are neither explainable, nor reproducible, existing studies indicate that increasing the reproducibility is achievable. For instance, most of the AI experiments are not well documented with only 20–30% of variables (features) properly described (Gundersen and Kjensmo 2018). Unfortunately, in certain situations immigration authorities prefer to withdraw from the use of AI systems rather than disclose documentation that would help to better understand their operation (e.g., UK Home Office).

Conclusions

Using AI in international migration management can lead to a more sustainable approach toward migration. However, there are numerous risks that are inherent to the use of AI, such as that algorithms rely on datasets and computational techniques that, both in their design and implementation, may reinforce inequalities, introduce bias and discrimination hampering progress towards SDG 10. The chapter explored three relevant challenges in harnessing technology for international migration management: 1) a solid legal framework, 2) addressing ethical issues and 3) technological robustness. To limit potential discriminatory practices, the legal framework needs to ensure that the technology is transparent and explainable. Furthermore, independent authorities should asses performance of algorithms (including when developed by private companies) and judicial review of algorithmic decisions needs to be guaranteed. Ethical challenges must be recognized at every step of design and deployment of AI systems. Adapting AI solution in international migration management should further be accompanied by broad public debates, which include migrants themselves. With regard to technical robustness, AI systems need to be carefully designed and engineered to avoid unintended consequences, and ensure protection of personal data. Making the technology more reliable and predictable to the society, in particular migrants, require achieving reproducibility in computational decision-making.

As AI systems are gaining increasing significance in migration management, it is crucial to consider their impact on the realization of the SDGs, in particular achieving orderly, safe, regular and responsible migration (SDG 10.7). At the same time, the complexity of international migration affects progress toward other SDGs such as development of sustainable food production and water management (SDG 2 and SDG 6), achieving gender equality (SDG 5), promotion of full and productive employment (SDG 8) and development of inclusive human cities and settlements (SDG 11). As presented in this chapter, a number of steps need to be taken to assure that, ranging from putting in place a legal framework to ensuring technical robustness. This should also include mitigation and addressing new challenges posed by the constantly changing migratory trends. For instance, in the close future, migration flows may be increasingly driven by the relocation of global manufacturing due to COVID-19 and geopolitical reshuffling (e.g., to the EU or the USA). Given growing use of AI system in international migration management and the accelerating technological progress, the area clearly requires further research. Cutting-edge solutions which are likely to be deployed in future need to observed and assessed, to catch up with the technologic

advancements. Furthermore AI systems will certainly enter new areas of migration management, which might carry specific challenges. For example, according to the UNESCO Working Group on Ethics of Artificial Intelligence, disaster risk management is an area where AI can aid prediction and response to environment hazards (UNESCO/COMEST 2019). Such a use of AI leads to a more sustainable approach to disasters, as it facilitates management and predict unexpected migratory flows. At the same time such performance of AI needs to be very carefully monitored, as it has the potential to cause severe unintended consequences. There are also proposals to use algorithms to analyze information such as population growth, incidents of extreme weather conditions, and GDP growth, to predict reaching tipping points that lead to mass migration (Nyoni 2017).

One of the key factors influencing the overall performance and sustainability of AI is the quality of data used. For the systems to be functioning properly, data needs to be collected and disaggregated by relevant features. Existing evidence indicate, however, that the quality of administrative records in migration remains questionable and many countries have limited capacity to properly collect and process digital data (Schumacher et al. 2019). Each algorithm needs to be tailored to the unique environment in which it is supposed to function, thus a mere transfer of a system trained on particular migrant population and socio-economic conditions to another environment will likely result in unintended consequences such as discrimination, inefficient allocation of resources and increasing distrust in public authorities.

As the usage of AI system in international migration management is increasing, states must consider this element within their migration policies, to "facilitate orderly, safe, regular and responsible migration and mobility of people, including through the implementation of planned and well-managed migration policies" (SDG 10.7). While not all states are using AI system in migration management yet, collecting and disaggregating data is a key step to adapt such systems in the future.

Cross-References

- ▶ Global Policy on Migration
- ▶ Labour Migration: Issues and Challenges in the Context of Sustainable Development Goals

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