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Leishmaniasis in Syria – A Call for Action of the European Society for Clinical Microbiology and Infectious Diseases (ESCMID) Study Groups for Infections in Travellers and Migrants (ESGITM) and for Clinical Parasitology (ESGCP)

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Editorial

Leishmaniasis in Syria – A Call for Action of the European Society for Clinical Microbiology and Infectious Diseases (ESCMID) Study Groups for Infections in Travellers and Migrants (ESGITM) and for Clinical Parasitology (ESGCP)

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Leishmaniasis is a neglected, vector-borne disease caused by parasitic protozoa from the genus *Leishmania*, transmitted by the bites of sandflies from the genus *Phlebotomus* (in the 'Old World') or *Lutzomyia* (in the 'New World') [1, 2]. It is endemic in tropical and subtropical regions, affecting millions worldwide [3, 4]. Clinical presentations, including cutaneous, mucosal, and visceral forms, vary by species, geography, and host factors. Leishmaniasis can be either anthroponotic (caused by *Leishmania tropica or L. donovani)* or zoonotic (caused by *L. major, L. infantum,* and others) [5]. As with many other vector-borne diseases, risk factors include poverty, malnutrition, conflict, forced displacement, climate change, and other environmental changes that influence vector distribution [6]. In non-endemic settings, leishmaniasis has been reported among travellers, migrants, and refugees [2, 7-12]. In areas where sandflies are endemic, combined with imported cases, may pose a significant public health risk for autochthonous transmission [2, 7-12]. Globally, a well-established association exists between intense armed conflict, climate, and cutaneous leishmaniasis (CL) [9-11].

While leishmaniasis has been highly endemic in Syria since the middle of the 1980s [13], it has historically affected mainly rural areas of Aleppo and Damascus, with CL (caused by *L. tropica* and *L. major*) being the most prevalent form. However, cases of visceral leishmaniasis (VL) (*L. infantum*) are also increasingly reported [14]. Syria's devastating conflict began in March 2011 when the now-defunct regime violently suppressed peaceful demonstrations. This unrest reversed the progress made in controlling leishmaniasis within Syria's borders [15] leading to a surge of cases, including in previously non-endemic areas in northeast Syria (NES), such as Raqqa, Deir Ezzor, and Hasakah governorates and in northwest Syria (NWS) in Idleb governorate (https://www.emro.who.int/syria/priority-areas/leishmaniasis.html) [15]. This shift has been attributed to the effects of the conflict and the ensuing mass internal displacement of people. Additionally, neighbouring refugee-hosting countries such as Lebanon, Turkey, and Jordan, where more than five of Syria's 6.4 million refugees sought safety (https://www.unhcr.org/refugee-statistics), saw an increase in cases [16].

Syria has the highest number of annually reported cases of CL in the World Health Organization (WHO) Eastern Mediterranean Regional Office (EMRO) region, accounting for around 35% of the 2.8 million cases reported between 2005 and 2023, with a lower range of 19% (2007) and upper range of 54% (2013) (https://www.emro.who.int/syria/priority-areas/leishmaniasis.html) (Figure 1). In 2019, nearly 90,000 cases of CL were reported in Syria (https://www.who.int/data/gho/data/themes/topics/indicator-groups/indicator-group-details/GHO/leishmaniasis). For comparison, before the conflict, an estimated 23,000 cases of CL were reported annually [17]. In Aleppo governorate, the incidence rate of CL more than tripled between 2007 and 2018 [18]. Between 2005 and 2023, an average of 25 cases of visceral leishmaniasis (VL) were reported annually, with a range of 3 cases in 2006 to 55 cases in 2017 (Figure 2). However, these numbers are likely underestimates due to widespread underdiagnosis and under-reporting [19]. For example, the non-governmental organisation MENTOR Initiative (https://mentor-initiative.org/country/syria/) has been responding to leishmaniasis in NWS for some

years; it reported an average number of 65 VL cases annually in this area alone between 2013 and 2024.

In July 2024, MENTOR Initiative had to cease its operations in NES due to a funding crisis, though it continues to operate in NWS. As of early 2025, leishmaniasis control has worsened, with a noticeable surge in cases and local healthcare workers raising alarms, particularly in NES. It is worth noting that NWS (Aleppo and its surroundings) primarily harbours mainly anthroponotic CL caused by *L. tropica*. In contrast, zoonotic CL due to *L. major* is highly prevalent in NES and rural Damascus (https://www.emro.who.int/neglected-tropical-diseases/countries/cl-syria.html). Unfortunately, there is also growing concern about drug resistance and treatment failure in the context of CL [20], and although there are vaccine candidates for leishmaniasis, these still are not approved [21-23]. The spatial distribution, along with the profound impacts of climate change, zoonotic spillover, conflict, displacement and urbanisation, makes the rising CL prevalence a major One Health issue that requires a multidisciplinary approach to contain.

Therefore, through this commentary, the European Society for Clinical Microbiology and Infectious Diseases (ESCMID) Study Groups for Infections in Travelers and Migrants (ESGITM) and for Clinical Parasitology (ESGCP) make an international call for action to raise awareness among funders and policymakers to avoid further abandonment of this already neglected disease and the often-marginalized populations whom it affects. In Syria's current transitional period, numerous competing priorities exist. However, the cutaneous form of leishmaniasis is considered by local organisations in northern Syria to be the most serious skin disease in the region. CL not only severely impacts the physical health of affected populations but also has significant mental health and social consequences, particularly for women and girls [24, 25]. Furthermore, should cases of VL increase, this could result in higher morbidity and mortality, given the challenges of diagnosis in Syria's devastated health system and the high mortality associated with delayed diagnosis or untreated disease.

The gold standard for diagnosing VL or CL is the visualisation of the amastigotes in the smears or tissue. Serology is also an available option, but culture and polymerase chain reaction (PCR) methods are limited in Syria. Newer, cost-effective methods, such as LAMP or rapid diagnostic tests, are not available in the country [26]. Whereas treatment options, which include amphotericin B, pentavalent antimonial drugs, paromomycin, miltefosine, or azoles, as well as thermotherapy [26], other local therapy techniques, depending on the form (VL, CL) and the invasiveness of the disease. However, the accessibility of these treatments is not equally assured in the country. Funding interruptions for key actors are already having an impact, with frontline healthcare professionals, particularly in northern Syria, sounding the alarm. Syria has also seen the emergence or re-emergence of previously controlled infectious diseases, including polio, measles, tuberculosis and cholera, among others [24, 25]. Though we focus on leishmaniasis in this Editorial, we do not detract from the need to tackle other communicable diseases and their root causes in Syria, particularly vaccine-preventable diseases, which disproportionately affect children and other vulnerable populations.

The toppling of Syria's regime in December 2024 and the broader regional instability have renewed interest in Syria, which had previously waned due to the protracted nature of the conflict and competing conflicts in the region and globally. A 2025 report from the United Nations Development Programme (UNDP) states that nearly 14 years of conflict in Syria have resulted in at least 618,000 direct deaths from the conflict. In a March 2023 report, the Syrian Network for Human Rights (SNHR) estimated that the former Syrian regime had arrested approximately 1.2 million Syrian citizens since 2011, with at least 135,253 people—including 3,691 children and 8,473 women in detention at the time of the report. (https://iiim.un.org/wp-content/uploads/2024/12/IIIM_DetentionReport_Public.pdf). Some were released at the time of the regime's fall, but the fate of many remains unknown.

Many more lives have been lost due to the weaponisation of health, starvation and besiegement and the direct targeting of civilians and civilian infrastructure. UN OHCA's (United Nations Office for the Coordination of Humanitarian Affairs) latest Humanitarian Needs Overview (HNO) notes the year-on-year increase in the number of People in Need (PiN) across all sectors of humanitarian response, including education, health, water, sanitation, livelihoods, and protection from 1 million in 2010 to 16.7 million in 2024 (Figure 3). PiN reflects not only the physical destruction of infrastructure but also the growing inability of Syrians to access essential services even where infrastructure remains intact but is non-functional. Economically, Syria's gross domestic product (GDP) has been halved, with more than 90% of the population now living in poverty. The UNDP estimates that, at the current pace, it will take Syria 55 years to restore its pre-conflict GDP levels (Table 1). Here, we found that PiN (https://www.undp.org/sites/g/files/zskgke326/files/2025-02/undp-sy-seia-final.pdf; https://www.unocha.org/attachments/5eef8c1a-fe65-4961-9d6e-a8bec0578724/Syria%20HNO%202024_EN.pdf) is an ecologically associated factor with VL; the increase in PiN is significantly associated with the number of VL cases reported in Syria between 2012 and 2023 (r^2=0.9048, p<0.0001).

The close relationship between social determinants, including poverty, poor housing, malnutrition and leishmaniasis, cannot be ignored. Children are significantly affected by CL lesions in exposed areas, particularly on the face; such lesions may be disfiguring and painful to treat. They may also exacerbate the stigma faced by displaced or impoverished populations, particularly for women and girls, where it may have social impacts, including affecting marriageability [27-29]. This could have further negative social impacts among populations disproportionately affected by poverty, unemployment and malnutrition. We also emphasise the negative impacts of the widespread damage to Syria's water infrastructure and its repercussions on infectious diseases in general and leishmaniasis in particular [30, 31]. The accumulation of rubble and waste, the absence of effective waste management programs, and disruptions in vector control initiatives have led to a surge in the sandfly population, which is known to breed in the cracks and rubble of destroyed buildings. Moreover, forced displacement and overcrowding have further increased human exposure to those vectors.

It is against this backdrop that the gains Syria had made pre-conflict in leishmaniasis control –along with efforts to control other infectious diseases, particularly vaccine-

preventable ones that previously had relatively high vaccine coverage rates– have faltered, leading to hundreds of thousands of reported cases, with much more likely to be unreported [14]. Before the conflict, leishmaniasis was most prevalent in rural areas, particularly around Aleppo (often referred to as the 'Aleppo boil') and Hama [32]. Since the uprising, more than half of Syria's pre-conflict population have been forced from their homes; among these are an estimated 7.2 million internally displaced people (IDPs) who are particularly vulnerable due to inadequate shelter (a large proportion remain in tented settlements) and with whom leishmaniasis spread to previously non-endemic areas within Syria [15]. The interruption of vector control measures, poor living conditions, breakdown in sanitation, infrastructure damage, increase in stray animals and overcrowding have allowed the sandfly vector to thrive, leading to an overall increase in cases of leishmaniasis, most of which are CL [33]. For example, in Amuda city in Al-Hasakah governorate, leishmaniasis cases have been linked to swamps. In the Hama governorate, the proximity of animal and human dwellings has contributed to the spread of the disease. In Hama, 4,500 cases were recorded in the first three months of 2024, with the Leishmaniasis Control Centre attributing this surge to poor services and the practice of raising animals near homes [14].

The scale of displacement within Syria and across the borders plays an essential role in delaying the diagnosis and treatment due to poor healthcare access, particularly for IDPs residing in rural areas or tented settlements, exacerbating this (Table 2). Such negative impacts of the conflict have adversely affected surveillance, often leading to delays in outbreak detection and response [34-37]. Though both of Syria's syndromic surveillance systems (EWARS in former regime areas and EWARN in areas outside of former regime control) tracked cases of suspected CL, under-reporting, politicised or delayed reporting is likely prevalent [19].

The destruction of most healthcare facilities outside regime-controlled areas due to shelling, with the reliance on both local and international NGOs playing a significant role in maintaining care in these areas, and the lack of investment in hospitals inside regime-controlled areas have severely affected patient care and access to healthcare [38, 39]. Interruptions to prevention, surveillance and management are also impacted by funding shortfalls such that existing vector control programmes and treatment centres are under threat; this includes recent changes to funding from the United States, e.g. USAID [40], which has led to the acute withdrawal of some key actors (https://reliefweb.int/report/syrian-arab-republic/policy-analysis-usaid-funding-freeze-and-its-impact-humanitarian-response-syria), particularly the MENTOR Initiative. In July 2024, such funding cuts negatively impacted the MENTOR Initiative's activities in NES, affecting approximately 3-4 million people in the area; however, they were able to maintain their activities in NWS, where 5-6 million people resided in parts of Idlib and Aleppo governorates not under former regime control. This key organisation has worked closely and successfully with local actors throughout the conflict for many years, and the cessation of its activities will have devastating impacts. It is the leading organisation to receive funding from the WHO and international donors to tackle leishmaniasis in northern Syria; they support vector control (indoor residual spraying and insecticide-impregnated bed nets), training, and access to treatment.

The vast population movements resulting from the protracted conflict have also impacted neighbouring countries, particularly Lebanon, Turkey and Jordan [16, 41, 42], where the majority of Syria's refugees sought safety [43-46]; however, cases among Syrian refugees have also been seen in European countries (e.g. Germany, Belgium, France, Sweden, Spain, Italy, among others) [47-50]. In addition to refugees, leishmaniasis has also been reported among travellers and migrants coming from Syria and diagnosed in several European countries (Germany, France, Sweden, Spain, Italy, Belgium, the Netherlands, Switzerland, and the United Kingdom) [51, 52]. In a study assessing 405 migrant children and adolescents in Berlin, Germany, between 7 October 2015 and 15 March 2016, 11% presented skin problems. Often, dermatologists with experience in travel medicine were unavailable to diagnose the conditions, leading to delays in treatment accurately [53]. Though the fall of the regime has allowed tens of thousands of Syrians to return to Syria, the level of devastation to large parts of the country continues to deter returns, particularly for those who have settled with their families in Europe or elsewhere. As such, ongoing, enhanced epidemiological reporting continues to be essential in host countries [36]. This should be conducted ethically and through refugee and migrant-sensitive approaches, considering the existing and rising discrimination faced by refugees and migrants in many of these countries and the additional stigma associated with leishmaniasis, particularly for CL, which may be more visible [54].

The ESGITM and ESGCP call for political will and donor support to ensure access to vector control, diagnostics, and treatment, thereby supporting Syria's population and healthcare professionals (Table 2). Although Syria's needs are vast across various sectors, addressing leishmaniasis and other communicable diseases through a One Health approach must be prioritised. This involves raising awareness among communities, healthcare workers, and veterinarians while empowering local organisations to implement sustainable solutions across multiple areas. These actions should include vector control, restoration of water and sanitation systems, improved waste disposal practices, and enhanced access to diagnostic and preventive materials, such as insecticide-treated bed nets, case management, vaccines, and essential medications. Furthermore, implementing these measures will yield secondary benefits for public health, enhancing broader disease prevention and overall health outcomes. At ESGITM and ESGCP, we emphasise our commitment to support our colleagues in Syria through equitable partnerships, practical help and bilateral education, given the experience many of them have gained over the last few years.

Declaration of interests

None.

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Table 1. Key human development indicators, Syria, 2010 and 2024, based on UNDP (https://www.undp.org/sites/g/files/zskgke326/files/2025-02/undp-sy-seia-final.pdf).

Human Development Indicators	**2010**	**2024***
Human Development Index (HDI) rank	0.661 (117)	0.557 (157)
Income Poverty	33% (≈7 million persons)	90% (≈20.7 million persons)
Extreme Income Poverty	11% (≈2.3 million persons)	66% (≈15.8 million persons)
Food Insecurity	-	89% (≈20.5 million persons)
Extreme Food Insecurity	1% (≈0.2 million persons)	60% (≈13.8 million persons)
Refugees	N/A	6,000,000
Internally Displaced	N/A	7,200,000
Unemployment	8%	24%
GDP/Capita	2,970	850 (2022)
Inequality (Gini)	33	41
Annual Minimum Expenditure Basket (MEB)	SYP 10,000	SYP 2,719,358
(Equivalent in Euros for Dec. 31 of the year)	€ 159.80	€ 200.99
(Exchange rate for Dec. 31 of the year, SYP per 1 €)	62.57	13,529.7

*Unless otherwise mentioned.
GDP = Gross Domestic Product, HDI = Human Development Index, SYP = Syrian Pound.
Note: Since the World Food Programme began monitoring the prices of MEB in 2013, the value of the MEB in 2010 has been estimated by converting its US$ value in 2024 into SYP using the average exchange rate from 2010.

504
505 **Table 2.** Recommendations for managing leishmaniasis in Syria amid the conflict.
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Category	Recommendations
Capacity Building	- Establish institutional and scientific partnerships to coordinate research and response strategies effectively. - Strengthen regional infrastructure for diagnosis, treatment, and surveillance. - Implement training programs for healthcare workers, community health workers, and local researchers. - Develop sustainable funding mechanisms to ensure continued control measures.
Translation of Research into Practice	- Enhance molecular diagnostics and expedite the detection of leishmaniasis cases. - Standardize diagnostic assays and information-sharing platforms among local and international organisations. - Promote clinical research on drug resistance and alternative treatments due to increasing treatment failures. - Enhance administrative infrastructure to ensure efficient healthcare delivery.
Repository & Surveillance	- Establish a central repository for Leishmania strains, sand fly specimens, and molecular tools to support research efforts. - Strengthen surveillance systems to monitor disease trends and emerging drug resistance. - Improve coordination between governmental and non-governmental organisations to address underreporting and case detection.
Vector Control & Prevention	- Restore and expand vector control programs such as indoor residual spraying and insecticide-treated bed nets. - Address environmental risk factors by improving waste disposal and reducing breeding grounds for sandflies. - Integrate leishmaniasis control into broader One Health strategies, including the monitoring of zoonotic diseases.
Access to Treatment & Healthcare	- Secure uninterrupted access to essential medications such as pentavalent antimonials and liposomal amphotericin B. - Develop decentralised treatment centres, especially in areas with displaced populations. - Ensure timely diagnosis and treatment of visceral leishmaniasis to reduce mortality rates.
Community Engagement & Public Health	- Raise awareness through health education campaigns targeting displaced populations and vulnerable communities. - Address stigma associated with cutaneous leishmaniasis, particularly its impact on women and girls. - Strengthen water, sanitation, and hygiene (WASH) programs to reduce exposure to vectors.

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Figure 1. Number of cases of cutaneous leishmaniasis (CL) reported in Syria between 2005 and 2023, based on the WHO dataset (the conflict began in 2011) (https://www.who.int/data/gho/data/indicators/indicator-details/GHO/number-of-cases-of-cutaneous-leishmaniasis-reported).

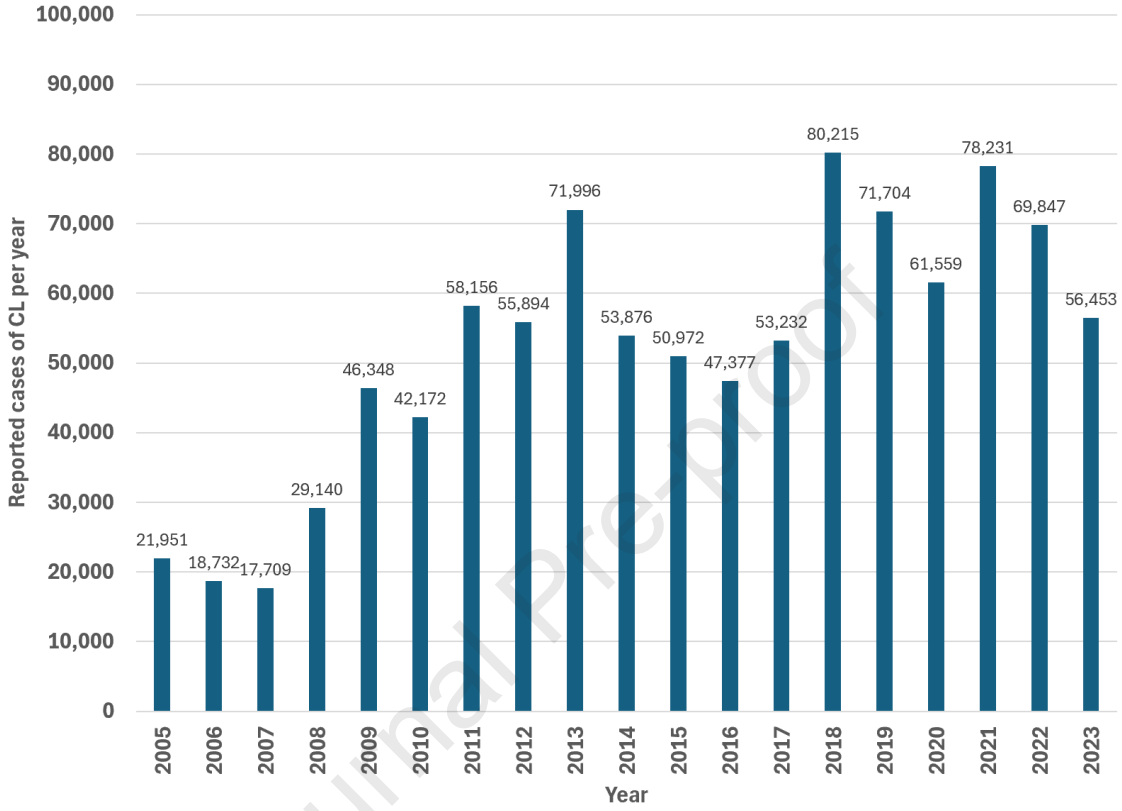

Figure 2. Number of cases of visceral leishmaniasis (VL) reported in Syria between 2005 and 2023, based on the WHO dataset (the conflict started in 2011) (https://www.who.int/data/gho/data/indicators/indicator-details/GHO/number-of-cases-of-visceral-leishmaniasis-reported).

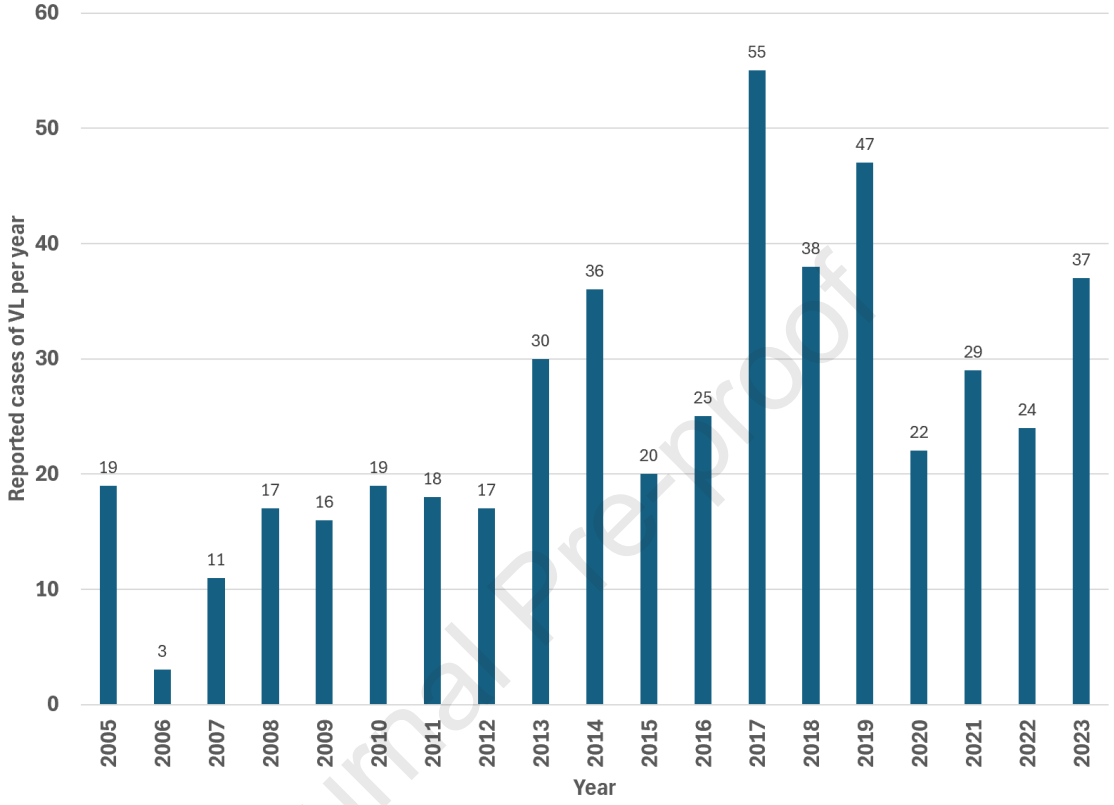

Figure 3. People in Need (PiN) in Syria from 2010 to 2024 (in millions), based on UNDP and OCHA (the conflict started in 2011) (https://www.undp.org/sites/g/files/zskgke326/files/2025-02/undp-sy-seia-final.pdf; https://www.unocha.org/attachments/5eef8c1a-fe65-4961-9d6e-a8bec0578724/Syria%20HNO%202024_EN.pdf).