WASWAC

HOT NEWS

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HOT NEWS

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The 6th WASWAC World Conference will be open soon

The 6th WASWAC World Conference will be open on Sept. 15, 2025 in Rabat, Morocco. Following this conference, a special training will be held.

We are waiting for your arrival in Rabat, see you there soon!

Resilient Landscapes: Innovations and Traditions in Climate-Adaptive Soil and Water Conservation (RISE-SWC)

September 15th—17th, 2025

Training: "Youth Capacity for Resilient Soil and Water Conservation in a Changing Climate "

September 18th—19th, 2025

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GEA International Scientific Conference "Global Challenges and Local Solutions in Natural Resource Management"

"If we do not change the way we treat soil and water, we will destroy the foundation of every economy"

INTERVIEW: José Luís Rubio, Honorary President of the World Association for Soil and Water Conservation, 29-31 May, 2025

Urbanization and unplanned tourism development can pose a dangerous threat. The most fertile soils are lost by being covered with concrete, asphalt, and tourist facilities. And once we lose that land, it cannot be recovered—or at least not easily. This is the most expensive loss that no economy can compensate for, Rubio warns.

PODGORICA – While the world is burning more and more often—both literally and metaphorically—through fires, droughts, and extreme climate fluctuations, Montenegro still treats soil as if it were an unlimited resource.

On one hand, we face droughts and forest fires; on the other—more frequent and destructive floods. Let us recall only the beginning of this century, when the Lim River near Berane, in the Gradinsko field, spilled over to

a width of more than one kilometre. For years, floods have affected the banks of the Zeta River, the shores of Lake Skadar, the Nikšić field, as well as the coast, where flash floods have caused serious consequences.

At the same time, for years we have been witnessing ruthless urbanization, in some places the unplanned expansion of tourist capacities at the expense of natural resources, deforestation, and irresponsible treatment of arable land.

This warning comes from one of the world's most respected experts in the field of soil and water conservation—Prof. Dr. José Luís Rubio, Honorary President of the World Association for Soil and Water Conservation (WOCAT), founder of the Spanish Center for Combating Desertification, and a man who has spent the last 40 years researching the problem of soil degradation worldwide.

His message is clear: if we do not change the way we treat soil and water, we will destroy the foundation of every economy, every aspect of health, and every form of security. Rubio does not speak from theory. He has over 40 years of experience working with governments, the UN, the European Union, and scientific centres on all continents. He came to Montenegro not only to share knowledge but also to help find concrete and applicable solutions. He emphasizes that Montenegro is still in a phase where it can choose: whether to follow the destructive patterns that other countries have already paid dearly for—or, with the help of knowledge, expertise, and science, move toward sustainable development.

"Soil degradation, loss of vegetation, and reduction of agricultural land—this means even more problems in the future. These are urgent issues of this specific moment. If we do not start addressing them, we risk losing resources essential for life," Rubio tells to Pobjeda.

That is precisely why, both in the international and national context, he advocates for concrete actions on soil and climate change actions that were the focus of an International Scientific conference in Podgorica (Montenegro) organized by the Montenegrin Academy of Sciences and Arts (CANU), the World Association for Soil and Water Conservation (WASWAC), and the GEA scientific platform. On this occasion, we spoke with him about the alarming trends in the use of soil resources, as well as about Montenegro's chances of becoming an example of good

practices.

"I have four decades of global experience in the field of soil protection and ecological engineering. I fight to prevent the land from becoming a desert. For more than 40 years, I have been studying the phenomena of soil degradation—especially in arid and semi-arid areas. These are regions where the danger of losing fertile soil, known as desertification, is the most pronounced. In these regions, over half a billion people live, and the loss of soil means the loss of food, health, identity, and even peace," said Rubio.

He has cooperated with the United Nations, the European Union, and dozens of countries in developing programs, projects, and recommendations for soil protection, and his work has been included in the reports and conclusions of the Intergovernmental Panel on Climate Change (IPCC).

He adds that Montenegro has natural capital that is great, but also vulnerable.

8 Društvo Ponedeljak, 11. avgust 2025 | POBJEDA

RAZGOVOR: José Luís Rubio, predsjednik Svjetske asocijacije za očuvanje zemljišta i voda (WOCAT)

Ako ne promijenimo način na koji tretiramo zemljište i vodu, uništićemo temelj svake ekonomije

Urbanizacija i neplanski razvoj turizma mogu biti opasna prijetnja. Najplodnija zemljišta bivaju izgubljena prekrivanjem betonom, asfaltom i turističkim objektima. I kada jednom izgubimo to zemljište, ono se nikako ili ne može lako vratiti. To je najskuplji gubitak koji nijedna ekonomija ne može nadoknaditi - poručuje Rubio

PODGORICA – Dok svijet sve češće gori – i bukvalno i metaforički – kroz požare, suše i ekstremne klimatske oscilacije, Crna Gora još tretira zemljište kao da je neograničen resurs.

Sa jedne strane, suočavamo se sa sušama i šumskim požarima; sa druge – sa sve češćim i razornijim poplavama. Sjetimo se samo početka ovog vijeka, kada se rijeka Lim kod Berana, na Gradinskom polju, izlila u širinu veću od jednog kilometra. Poplave su pogodale pribalje Zete, obode Skadarskog jezera, pa Nikšićko polje, kao i Primorje, gdje su bujične vode izazivale ozbiljne posljedice.

Istovremeno, godinama svjedočimo bespoštednoj urbanizaciji, na pojedinim mjestima neplanskom širenju turističkih kapaciteta na uštrb prirodnih resursa, sječi šuma i neodgovornom tretiranju obradivih površina.

TLO SE UBRZANO TROŠI

Ono što se, međutim, previđa jeste da se najvažnije bitke za budućnost ne vode na marginama političkih govora, već upravo na tlu – doslovno. A to tlo - zemljište se ubrzano troši, zagađuje i degradira.

Ovo upozorenje dolazi od jednog od najcijenjenijih svjetskih eksperata u oblasti zaštite zemljišta i voda – prof. dr José Luisa Rubia, predsjednika Svjetske asocijacije za očuvanje zemljišta i voda (WOCAT), osnivača španskog Centra za borbu protiv desertifikacije, i čovjeka koji je posljednjih 40 godina posvetio istraživanju problema i degradacije zemljišta u svijetu.

Njegova poruka je jasna: ako ne promijenimo način na koji tretiramo zemljište i vodu, uništićemo ono što je temelj svake ekonomije, svakog zdravlja, svake sigurnosti.

Rubio ne govori iz teorije. On ima više od 40 godina iskustva u radu sa vladama, UN-om, Evropskom unijom i naučnim centrima na svim kontinentima. Došao je u Crnu Goru da ne samo podijeli znanje, već da pomogne u izналажењу konkretnih i primjenjivih rješenja. Ornagljava da se Crna Gora još uvijek nalazi u fazi u kojoj može da bira: hoće li izgraditi destruktivne obrasce koje su drugе zemlje već skupo platile – ili će, uz pomoć znanja, struke i nauke, krenuti putem održivog razvoja.

- Degradacija zemljišta, nestanak vegetacije, šumski požari, klimatske promjene – to nije više problemi budućnosti. To su hitna pitanja sadašnjosti. Ako ih ne rješavamo strateški, rizikujemo da izgubimo resurse koji se ne mogu povratiti - poručuje Rubio u razgovoru za Pobjedu.

Osnivanje studijskog programa iz ekološkog inženjeringa od ključnog značaja

José Luis Rubio ističe da je osnivanje studijskog programa iz ekološkog inženjeringa od ključnog značaja za Crnu Goru. - Ova oblast više nije luksuz, već strateška potreba za očuvanje prirodnih resursa i prilagođavanje klimatskim promjenama. Takav program bi, prema njegovim riječima, omogućio obrazovanje domaćih stručnjaka koji bi mogli povezati nauku, praksu i javne politike, te rješavati konkretne izazove u upravljanju zemljištem i vodama. Naglašava da obrazovanje mora biti zasnovano na lokalnom kontekstu, ali povezano s međunarodnim standardima, jer – sistemske promjene uvijek počinju obrazovanjem - smatra Rubio.

Naučne konferencije kao GEA korisne za razmjenu znanja i mišljenja

Rubio je bio učesnik međunarodne konferencije GEA u Crnoj Gori i ocijenio je da ovakvi skupovi imaju ključnu ulogu u globalnoj borbi protiv degradacije zemljišta i dezertifikacije. - Naučne konferencije ne smiju biti zatvorene akademske rasprave, već praktične platforme za razmjenu znanja i rješenja. Prema njegovim riječima, Crna Gora ima šansu da gradi održivu budućnost kroz nauku, saradnju i edukaciju mladih, jer zaštita zemljišta i prirodnih resursa jeste - borba za budućnost - poručio je Rubio.

Jose Luis Rubio

POTREBNA PRAKTIČNA RJEŠENJA

- Došao sam kao partner i sada lični prijatelj mojih kolega iz Crne Gore. Moj cilj nije samo da podijelim znanje, već da pomognem da se nađu praktična rješenja. Crna Gora ima velike potencijale prirodne resurse – zemljišta, vodu, vegetaciju. Međutim, upravo ono što vam je prednost, može postati ranjivost ako se time ne upravlja pažljivo - kaže je. Upozorava da urbanizacija i neplanski razvoj turizma mogu biti opasna prijetnja.

- U mnogim zemljama vidimo isti obrazac: najplodnija zemljišta bivaju izgubljena prekrivanjem betonom, asfaltom i objektima turističkih kapaciteta. I kada jednom izgubimo to zemljište, ono se nikako ili ne može lako vratiti. To je najskuplji gubitak koji nijedna ekonomija ne može nadoknaditi.

Pitali smo ga kako Crna Gora može izbjeći greške drugih, najrazvijenijih koji su ispred nas iskoračili u ove greške.

Rubio insistira na tome da planiranje korišćenja zemljišta ne može biti parcijalno niti vođeno samo kratkoročnim ekonomskim interesima.

- Zemljište mora biti upravljano na osnovu vođenja struke i nauke. Globalno, moramo jačati otpornost lokalnih zajednica, pogotovo periurbanih i industrijskih zona. Neophodno je razmišljati kako klimatske promjene utiču na zemljište – kako na eroziju, kako na vegetaciju, na zadržavanje vode. Crna Gora može tu postati lider, jer još uvijek ima šansu da ne krene pogrešnim putem - istakao je on.

Tvrdi da znanje ne smije ostati u zatvorenim krugovima.

- Zato su ovakve konferencije, kao ova održana u Crnoj Gori, važne. Mi eksperti ne dolazimo da držimo predavanja, već da testiramo naše ideje u praksi, da ih konfrontiramo sa lokalnim kontekstom i naučimo nešto novo. Izuzetno je važno da te naučne spoznaje ne ostanu zatvorene u akademiji i na institucijama, već da se prenesu lokalnim zajednicama, planerima, mladima, donosiocima odluka - poručuje Rubio.

U tom duhu, profesor Rubio snažno zagovara uključivanje mladih i edukaciju kao ključnu alatku:

- Ako ne „inficiramo" omladinu znanjem o prirodi, riziku-jemo da dobijemo generacije koje će trčati za novcem i investicijama, ne znajući da uništavaju sopstvenu budućnost. Već u školama treba učiti djecu zašto je važno da štite zemljište, vodu, biodiverzitet - kaže je Rubio dodajući da je Evropska unija – prilika za bolji balans.

VAŽNOST EU NORMI

U kontekstu evropskih integracija Crne Gore, Rubio naglašava važnost normi i praksi koje EU donosi.

- Evropska unija je zreo savez u odnosu na ova pitanja. EU ne posmatra degradaciju zemljišta i voda samo kao tehnički problem, već kao strateško pitanje opstanka. Ona ne uvodi kazne, već stvara sistem u kojem društva sama uče da čuvaju ono što im pripada. Za Crnu Goru, ulazak u EU je prilika da prisustvo tom znanju, ali i obaveza da preuzme odgovornost - naglasio je.

Na kraju razgovora, profesor Rubio je postavio nekoliko pitanja koja bi trebala da se urežu u svijest svakog pojedinca:

- Da li zaista čekate da pijete kontaminiranu vodu? Da li čekate da vam zemljište bude trajno uništeno? Da jedete kontaminiranu hranu? Ili ćemo se sada okupiti, da zaštitimo ono što imamo za nas i za buduće generacije? Borba protiv degradacije zemljišta nije luksuz. Ona je uslov opstanka - kazao je.

N.KOVAČEVIĆ

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https://www.geasci.org/gea2025

WCSS2026: The 23rd World Congress of Soil Science, Nanjing, China

Theme

The WCSS2026 theme, 'Soil and the Shared Future for Humanity' focuses on the importance of soil for our future, with a variety of arrangements including poster exhibition, young researcher forum and soil judging contest. Tours will also be organized for participants to visit typical soils in combination with unique landscapes and cultural diversification as China is a vast country with rich soil resources.

Session Description

This session highlights the power of intergenerational collaboration in shaping a more inclusive, connected, and forward-looking soil science. In line with the IUSS Strategic Plan and YECS goals, we will explore successful partnerships, identify challenges in knowledge transfer, and propose innovative strategies to bridge generational gaps in research, education, and outreach.

Important Dates

* Online registration opens: July 7, 2025
* Abstract submission opens: July 7, 2025
* Abstract submission deadline: November 7, 2025
* Abstract review: November 2025—February 2026
* Abstract results notification: February 7, 2026
* Early bird registration deadline: March 7, 2026
* Regular registration deadline: May 7, 2026
* Cancellation and refund deadline: May 7, 2026

Relevance & Format

Empowering the next generation is key to the future of soil science. This session supports IUSS priorities by promoting inclusive, inter-disciplinary collaboration between young and senior scientists. The format includes short oral presentations and a dynamic interactive discussion, encouraging shared dialogue on best practices for intergenerational knowledge exchange and co-creation.

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https://www.23wcss.org.cn

Erosivity Density as An Indicator of Soil Erosion Risk in South Asia

Highlights

- Comprehensive analysis of erosivity density across South Asia from 1980 to 2018 using high-resolution precipitation data and advanced analytical methods.
- Identification of significant erosivity hotspots in the Western Ghats and northeastern Himalayas
- Mann-Kendall trend test showed increasing ED trends in the Indo-Gangetic plain and decreasing trends in parts of Pakistan and northwestern India.
- Wavelet transform analysis uncovered significant biennial and decadal cycles in ED.

Abstract

Soil erosion presents substantial environmental issues, affecting agriculture, water quality, and biodiversity, with approximately 24 billion tonnes of productive soil lost annually worldwide. This is especially critical for South Asia, which is a hotspot for soil loss and has an economy dependent on agricultural productivity. Rainfall is a primary agent of erosion, and erosivity density (ED), which is the rainfall erosivity per unit of precipitation, is a measure of the interaction between the kinetic energy of rainfall and the soil surface. But a large-scale assessment of erosivity density currently doesn't exist for South Asia. Using precipitation data from 1980 to 2018 and analytical techniques such as Mann-Kendall trend analysis and wavelet transform analysis, this study detects significant trends in erosivity density, highlighting regions most susceptible to soil erosion. Rainfall erosivity (R-factor) was calculated using high-resolution precipitation data (I60) and kinetic energy equations. Prominent areas with high erosivity density were detected in the Western Ghats and Northeastern Himalayas. Additionally, high ED values were observed in northeastern India, certain areas of Pakistan, and central and southern India. An increasing trend in ED was detected in the Indo-Gangetic plain, suggesting increased erosion risk. In contrast, declining patterns in certain regions of Pakistan and northern India indicated a decrease in rainfall intensity or frequency, potential impacting water availability. The wavelet

transform analysis showed significant biennial and decadal patterns in ED, indicating climatic influences in South Asia. Biennial cycles showed variations in power levels, ranging from 0.75 to 1.05 in certain years, highlighting significant fluctuations in erosivity density intensity that result in substantial changes in soil erosion risk, demanding robust and adaptive conservation strategies. The study highlights the necessity for region-specific soil conservation techniques to mitigate erosion risks, providing a foundation for effective soil conservation and land management strategies in South Asia.

Introduction

Dash et al. (2019) explored the relationship between rainfall intensity, RE, and ED in the Eastern Ghats Highland, India, finding a strong positive correlation where ED values were nearly half of rainfall intensity, aiding in identifying erosion and landslide-prone areas. Similarly, Teixeira et al., 2022a, Teixeira et al., 2022b investigated RE and ED in São Paulo State, Brazil, using synthetic data to define homogeneous regions and develop regression models. They found that the highest annual ED values occurred in areas of intense agriculture, with 60 % of the erosivity concentrated between December and March. Despite these localized assessments, there remains a gap in large-scale studies of erosivity density, which are essential for broader applications in environmental management. Such studies would provide critical insights into erosivity's impact across larger regions, enabling the development of more effective soil conservation policies and strategies.

Therefore, the present study is the first comprehensive assessment of erosivity density (ED) across South Asia, using high-resolution precipitation data from 1980 to 2018. This study analyses significant temporal and spatial variations in ED, identifying critical hotspots and trends not previously documented at this scale. These findings offer valuable insights into the impact of seasonal precipitation on erosion, enhancing the understanding of erosivity density dynamics from local scale to national and international level. This study sets a precedent for future research in other precipitation-affected regions and informs more effective soil conservation strategies globally.

Thus, the main objectives of this study are to: (1) utilize long-term precipitation data and

advanced analytical techniques to examine erosivity density (ED) patterns, (2) identify hotspots for erosivity, erosivity density, and precipitation using high-resolution gridded precipitation data and spatial analysis tools, (3) apply the Mann-Kendall trend analysis to assess temporal trends in erosivity density over the study period and across different seasons, and (4) employ wavelet transform analysis to investigate the periodicity and intensity of erosivity density phenomena, focusing on critical periods of the southwest and northeast monsoons. These objectives aim to provide insights into the spatial and temporal variability of erosivity density and its implications for soil conservation and land management strategies in South Asia.

Read More

https://www.sciencedirect.com/science/article/abs/pii/S0341816225000682

Afforestation Turns Barren Ravine Into Green Oasis

A historical photo shows people carrying saplings to plant in Youyu county, Shanxi province, in the 1970s.

For over 40 years, Wang Zhanfeng had rooted himself in the barren mountains of Youyu county in the northern province of Shanxi. Starting from the challenging task of planting the first sapling amid swirling yellow sands, he has now transformed over 200 hectares of land into lush woodland, significantly altering the local ecosystem.

Wang, 74, a villager from Laoqiangkuang village, bears calloused hands as evidence of his decades-long dedication.

"In my childhood, we had to cover our bowls while eating, otherwise they would be filled with sand," Wang told China Daily. Villagers

had to wear windproof goggles and sand masks when venturing outside. During the worst winds, they had to light lamps indoors during the day.

Youyu is situated less than 100 kilometers from the Mu Us Desert spreading between the Inner Mongolia autonomous region and Shaanxi province, positioned in a natural wind corridor where the Siberian cold air moves southward.

In the early years of New China, the county faced severe environmental conditions with extensive land desertification and extremely low plant survival rates. It was once deemed by international environmental experts as one of the "least suitable areas for human habitation", prompting suggestions for the relocation of the entire county.

However, the locals were determined to make a change.

Wang Zhanfeng checks the growth of apricots at his family's orchard in Laoqiangkuang village in Youyu.

An aerial photo shows part of a forest park in Youyu, which has been transformed from a barren area through decades of afforestation.

After numerous failed attempts, he gradually mastered the art of tree planting. After 2000, the survival rates of his trees reached 80-90 percent and now, it's close to a perfect score.

Today, green grass, Mongolian pine, pitch pine, and larch trees cover the Shipaogou area — what was once a barren ravine had transformed into his daily "green sanctuary".

Carrying scissors during his mountain patrols, he prunes crooked branches as if he is tending to his own children. "While the green hills and clear waters have taken shape, the transformation is not yet complete," he said.

Throughout history, Youyu had been a meeting point of agricultural and grassland civilizations, as well as a crucial passage for Shanxi merchants traveling to Mongolia. However, continuous wars had ravaged its ecology.

For over 70 years, Youyu had relentlessly pursued tree planting and afforestation to improve the environment. With nearly 130 million trees planted across almost 113,333 hec-

tares, the county's forest cover surged from less than 0.3 percent to 57 percent. What was once a "barren land" had metamorphosed into a "green oasis".

In October 2024, the 19th annual session of the Global Forum on Human Settlements and the New Sustainable Cities and Human Settlements Awards ceremony took place at the United Nations Headquarters in New York.

The submission from Youyu county, detailing the "70-year practice of desert control, afforestation, and ecological restoration", clinched the New Sustainable Cities and Human Settlements Award.

Ma Zhanwen, Party secretary of Youyu, said, "Over the 70 years, Youyu's ecological civilization practice, through the diligent efforts of several generations, vividly exemplifies the 'lucid waters and lush mountains are invaluable assets' concept of green development, paving a viable path for ecological restoration and sustainable development in desertified regions."

Today, Youyu is vigorously nurturing forest tourism and forest health industries, establishing the largest domestic horse breeding base in operation and the largest youth football training base in North China.

Besides, they are actively developing a 1 billion yuan ($140 million) sheep industry and a 500 million yuan sea buckthorn industry chain.

Last year, the county welcomed 6.22 million visitors from home and abroad, generating tourism revenue of 3.58 billion yuan.

Wang Zhanfeng's unwavering efforts have garnered recognition from various quarters, earning him honors such as the "Shanxi Province Watershed Governance Model" and the "Shanxi Province May 1 Labor Medal" in recent years.

"Youyu people understand trees. Without afforestation, this place would have long succumbed to sandstorms," Wang said. "To me, the Youyu spirit means afforestation, and it must continue steadfastly."

News Source

https://www.chinadaily.com.cn/a/202508/01/WS688c177aa310c26fd717ce67.html

Review of Sediment Connectivity: Conceptual Connotations, Characterization Indicators, and Their Relationships with Soil Erosion and Sediment Yield

Soil erosion is an important driver of land and ecological degradation, with hydraulic erosion in particular leading to widespread impacts and damage. As an important concept and indicator for characterizing the potential and pathways of sediment production and transportation within watersheds or on slopes, sediment connectivity has gained global attention and thus been analysed since its proposal in 2003. Sediment connectivity has become an effective metric for analysing the sources, processes, and potentials of soil erosion and sediment yield (SY) in watersheds, and it has been considered a popular research topic in the field of soil erosion over the past decade. Considering the lack of up-to-date systematic reviews of conceptual connotations, characterization indicators for sediment connectivity, and quantitative relationships between these indicators and erosion and SY, a bibliometric analysis of "sediment connectivity" was conducted via the CiteSpace tool, which is based on the Web of Science (WOS), Scopus (Elsevier) and China National Knowledge Infrastructure (CNKI) databases. In this research, the current state, popular topics, and trends in relevant studies were identified, and the conceptual connotations, influencing factors, and indicator algorithms of sediment connectivity and their quantitative relationships with soil erosion and SY were summarized. Furthermore, the contents and directions to be strengthened and improved in the future were determined. The results indicated that over the past 21 years, sediment connectivity has been analysed in 123 countries or regions. Researches have focused primarily on related concepts, indicators, scales, and influencing factors. This concept has been widely applied in various practices such as soil and water resource regulation, land use optimization, and soil erosion control. In previous studies, several linear ($SY = a \cdot IC + b$) and exponential ($SY = a \cdot e^{b \cdot IC}$) increasing relationships between sediment connectivity indicators (such as the index of connectivity (IC)) and SY at the slope or watershed scale have been established, facilitating the development of research on prediction and attribution analysis

for the identification of sediment sources and changes. There is a consensus on "what sediment connectivity is" to date, but a unified and complete system has not been yet formed for sediment connectivity and several of its derived concepts. The Index of Connectivity (IC), as the primary means for quantitatively characterizing the status and distribution of sediment connectivity, has led to the creation of more than 20 different algorithms, whereas the included parameters mainly reflect the internal factors influencing topography and land use/cover. The effects of climatic factors and human activities have not been fully considered in previous studies, which has led to relatively backwards researching on functional connectivity indicators. Hence, the classification systems and theoretical frameworks for a series of concepts must be further refined on the basis of sediment connectivity, such as the objective openness, scale dependence, comprehensive impact, and distribution heterogeneity. Moreover, the amount of research on the influences of external drivers and the coupled effects of different factors on indicators of sediment connectivity should be increased. Nevertheless, it is still necessary to explore certain aspects, such as the parameter combinations and normalization methods of the upslope and downslope components of the IC algorithm, and to continuously improve the explanation of the dynamic changes in sediment while considering both hydrological connections along flow paths and off-site impacts on underlying surface variations. Moreover, there is a need to increase the spatiotemporal scale of research on sediment connectivity, explore its feedback mechanisms and close quantitative relationships with soil erosion and SY, focus on the integrated application of different indicators (methods), and validate and results via multisource information to promote relevant applications. The obtained results provide valuable reference for the refinement of theories and methods for sediment connectivity and enhance its support of studies of soil erosion and SY in watersheds.

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https://www.sciencedirect.com/science/article/pii/S0012825225000522

Hazardous Science that Helps to Save and Improve Lives Needs More Support

Research into the growing environmental problem of urban gullies highlights the challenging conditions under which many socially important studies are done.

Scientific knowledge is produced mainly at a distance from the risks that researchers seek to understand, and from the people affected by the hazards. But in some parts of the world, researchers are not separated from those hazards: they work in unstable environments with limited resources and sometimes under life-threatening conditions. A study published in Nature this week1 offers a reminder of how high the stakes are when conducting this type of research, and highlights the urgent need to better support such work.

The subject of the study was urban gullies — deep, often rapidly expanding channels

formed mainly by rainwater run-off in unstable, sandy soils. In most cities, many of which are in tropical regions, the formation of these gullies is increased when rainwater that accumulates in roads and on rooftops without suitable drainage systems is channelled onto unprotected soil. Once formed, these deep cuts in the ground stretch for hundreds of metres and, over time, tear through crowded cities, swallow houses and infrastructure and devastate lives and livelihoods.

The consequences of urban gullies have already been documented by studies in, for example, Nigeria, Uganda, the Republic of Congo4 and Brazil. In the Nature study, researchers based in Belgium, the Democratic Republic of the Congo (DRC) and Poland used a combination of satellite imaging and field research to produce a country-wide map of urban gullies across the DRC. They identified nearly 3,000 gullies, spread across 26 of the 47 cities they studied. Kinshasa — the DRC's rapidly expanding capital, which has an estimated population of nearly 18 million people — is one of the most affected. There, the researchers identified 868 urban gullies with a combined length of 221 kilometres.

Their best estimate is that some 120,000 people have been displaced by urban gullies in the DRC between 2004 and 2023. Within the next 10 years, 28% of about 550,000 people living in the expected expansion zone of gullies are likely to be displaced if nothing is done.

At least some of what needs to be done is clear. Gully formation and expansion can mostly be avoided with better urban planning and improved drainage systems. But in many fast-growing cities in the low- and middle-income countries most affected, urban-planning efforts are simply not keeping up. Once a gully has formed, stabilizing it to prevent further expansion comes with huge costs in places where financial resources are often limited, institutional mandates to deal with the problem are unclear and technical capacity is lacking. And so the damage continues.

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The people who bear the brunt tend to be society's poorest. It is often these individuals who resort to building homes and settling on unsafe lands. They might understand the risks they face, but they have no real choice but to live with them. People living on the edge of an expanding gully often find that they are unable to sell their land, leaving them trapped, with no other option but to seek shelter with relatives or friends on rainy nights, when there is a risk of further collapse.

This latest study is a reminder that high-quality, world-changing research often comes from working in difficult conditions with limited resources and far from high-tech laboratories. While the paper was under consideration at Nature, one of the study authors was in eastern DRC when renewed conflict broke out in the region. Electricity was down for many hours during the day and mobile-phone networks often failed — obstacles invisible in the final publication.

More broadly, the study is also a reminder of the responsibilities such research brings. While performing their fieldwork, the scientists were confronted with the stark consequences of gully formation for people on the ground. During a field trip to Kinshasa in 2019, the team met a mother whose family home stood near a gully edge. Two days later, several of her children were killed when a gully collapsed overnight near a relative's house the family had sought shelter at. At least 40 people died that night.

Research in challenging conditions should be better supported, funded and appreciated on its own terms. Institutions, funders and publishers must show heightened awareness of what such studies take to produce and the importance of publicizing the results. The ultimate purpose of science is not only to understand the world, but also to help make it safer. The whole research ecosystem must pull together to assist that aim.

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