



*Global Webinar on Geospatial and Other Data Sources for Environment Statistics:
Assessing the Impact of the Economy on the Environment*

Detection of mining activities and its impacts on the environment

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Context



Photo: Mine d'Edikan, Ghana © Perseus Mining Limited



Photo: Bantakokouta, Sénégal © Ndeye Maramé Ngom



Photo: Pépite d'or © shutterstock.com/ Phawat

Artisanal and small-scale gold mining is an important economic activity in developing countries with gold resources.



Photo: Oumé, Côte d'Ivoire © David Baratoux



Photo: Kaoukougnanou, Côte d'Ivoire © Ndeye Maramé Ngom



Photo: Bantakokouta, Sénégal © Ndeye Maramé Ngom

Artisanal gold mining: an activity motivated by poverty

Employment: 8 million people (direct employment) and 46 million people (dependent)



Photo: Kharakhéna, Sénégal © Ndeye Maramé Ngom



Photo: Kharakhéna, Sénégal © Ndeye Maramé Ngom



Photo: Tenkhoto, Sénégal © Ndeye Maramé Ngom

Artisanal gold mining: a threat to the environment, health and society

Child labor, deforestation, insecurity, water pollution, DMA, soil degradation etc.



Photo: Yasmina (8ans), Burkina Faso © Larry C. Price



Photo: Bantakokouta, Sénégal © Ndeye Marame Ngom



Photo: Bandama, Côte d'Ivoire © Ndeye Marame Ngom



Photo: Kharakhéna, Sénégal © Ndeye Marame Ngom



Photo: Mercure (amalgamation) © Ngom Marame Ngom

Efforts to regulate artisanal gold mining

Over the past several years, governments such as Ghana, Côte d'Ivoire, and Senegal have embarked on the process of promoting legal artisanal and small-scale gold mining with best practices, and to control and monitor illegal expansion of mining sites.

Thus, new reforms on gold panning have been decided. These laws consist, among other things, of creating official perimeters for artisanal gold mining within which the activity of gold panning would be declared and legal.

- In Senegal Order No. 009249 of June 14, 2013 appointing: "Ministerial Order on the organization of artisanal gold mining".
- In Côte d'Ivoire : Plan National de Rationnalisation de l'Orpillage (PNRO, 2013).
- In Ghana: the Mines and Minerals Act, 2006, Act 703 and the National Mining Policy, 2014.

Current challenges for the implementation of these reforms

A constant evolution of gold panning activities driven by the discovery of new mining sites and the abandonment of less profitable sites. This reality is sometimes incompatible with the definition of official perimeters.

Because of the distance and lack of objective information, it is difficult to regularly monitor ongoing activity and to verify if/when activities take place outside these corridors.

Need to make frequent field campaigns which can be very costly for the institutions in charge of the regulation of the activity.



Contribution of space technologies

Monitoring of artisanal gold mining sites from space

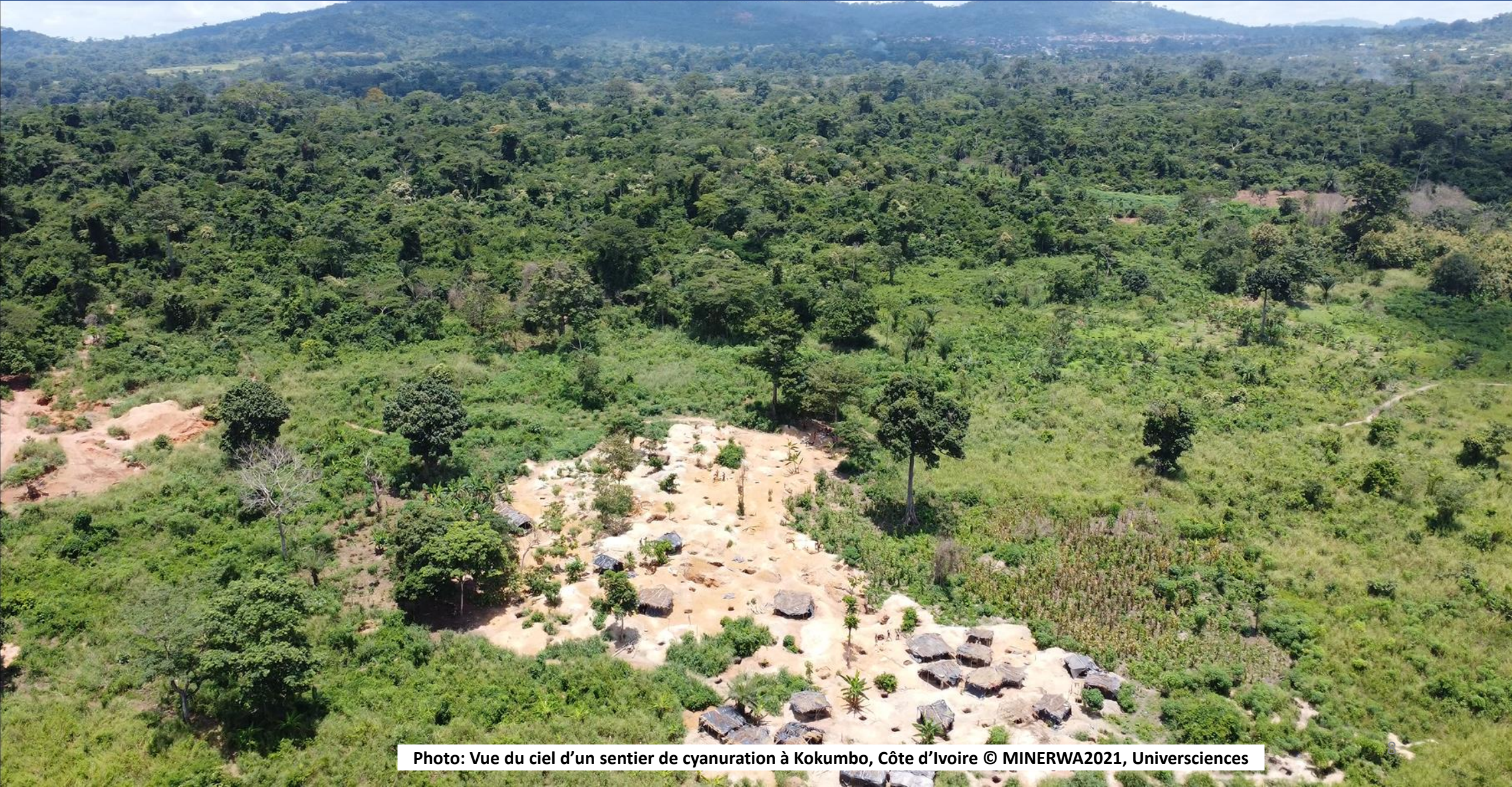


Photo: Vue du ciel d'un sentier de cyanuration à Kokumbo, Côte d'Ivoire © MINERWA2021, Universciences

Observations from space can be used to detect mine sites and assess their impact on the environment.

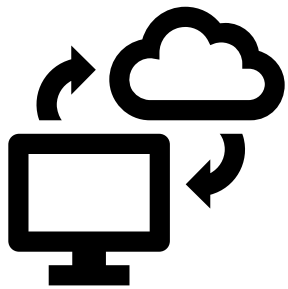
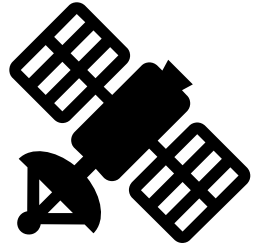
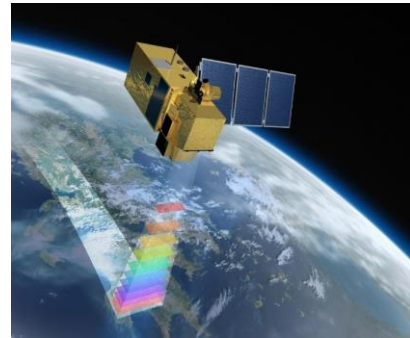
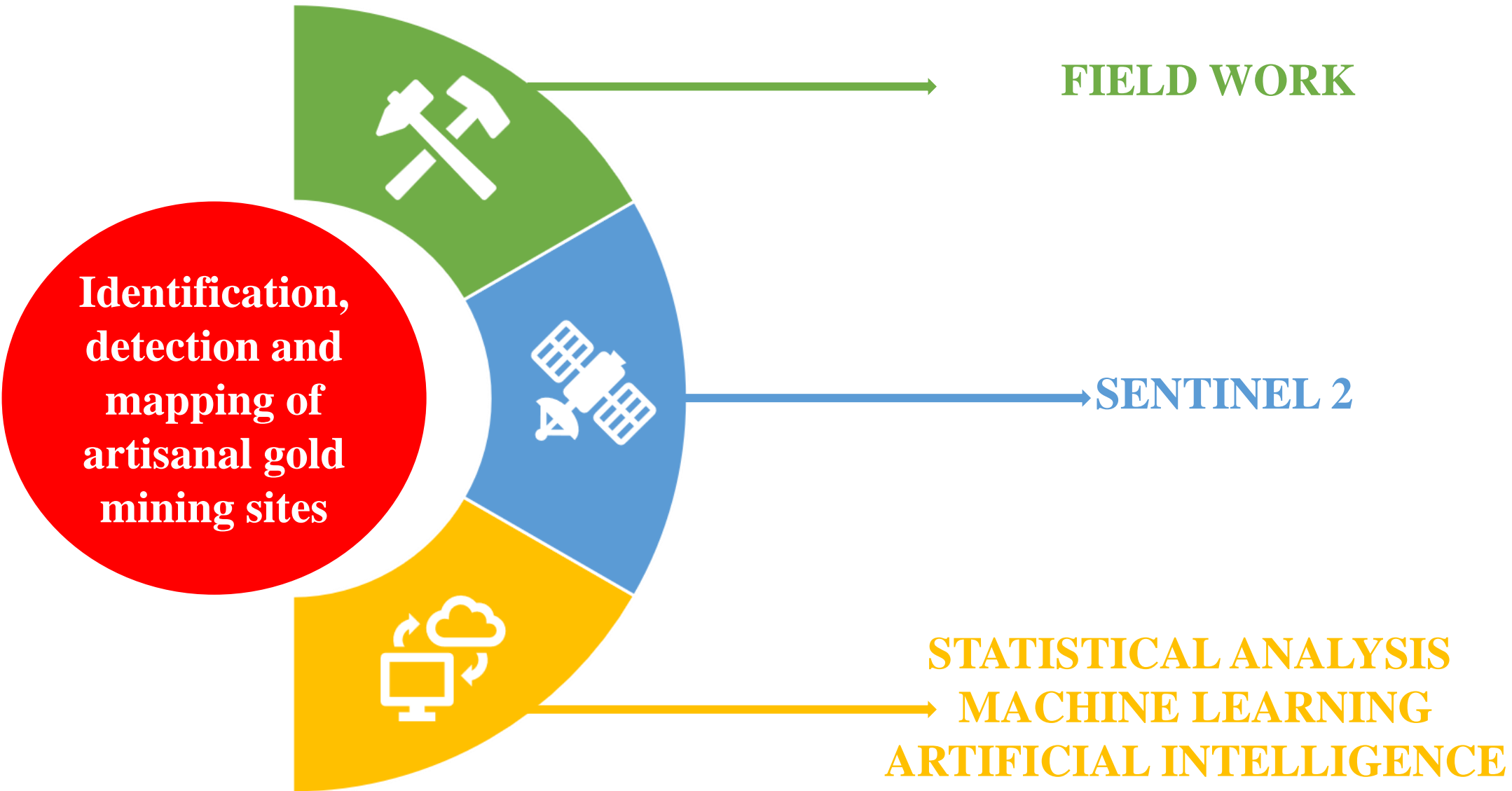


Photo: Kharakhéna, Sénégal © Ndeye Maramé Ngom

Remote sensing and artisanal mining: the different applications

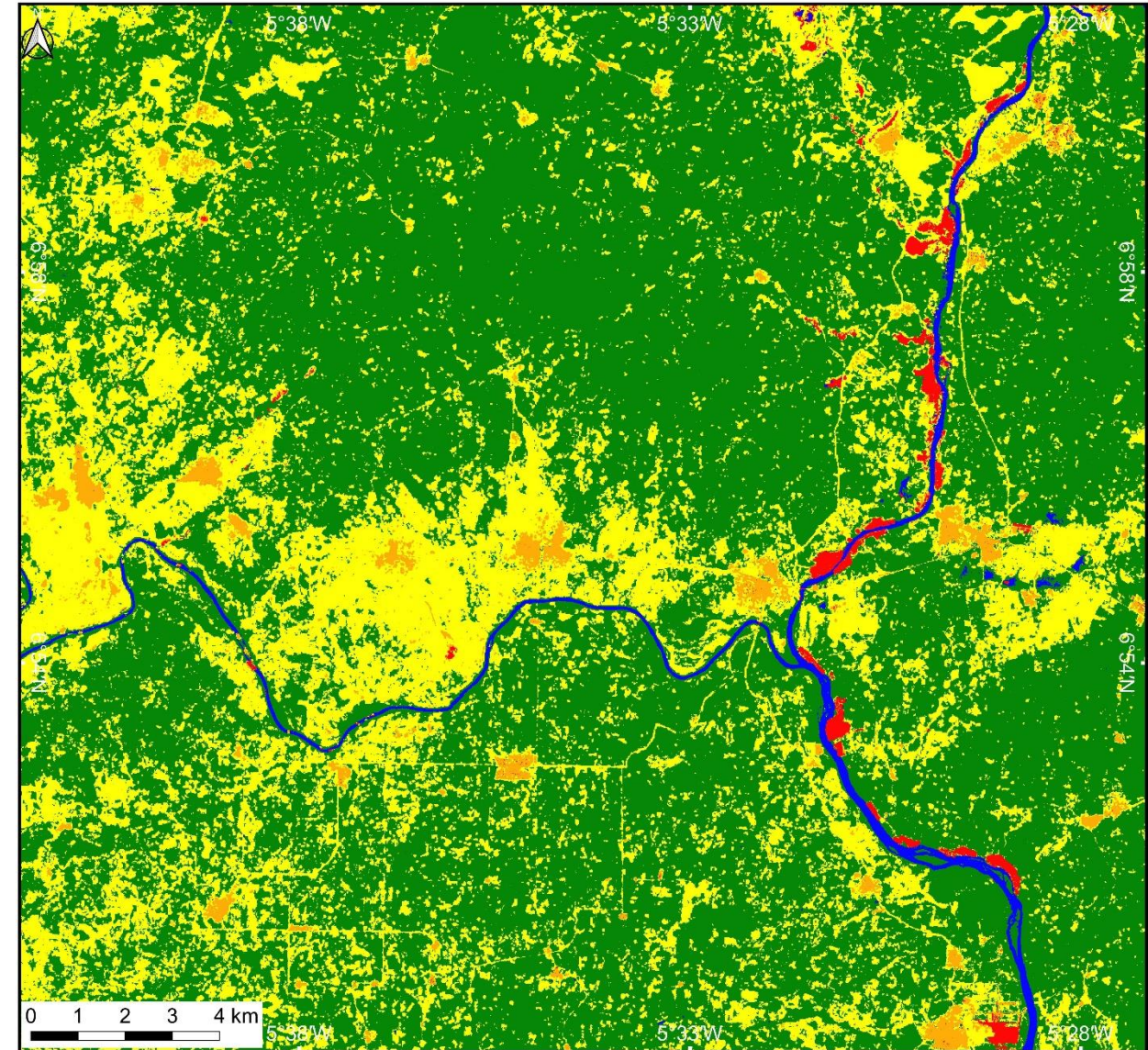
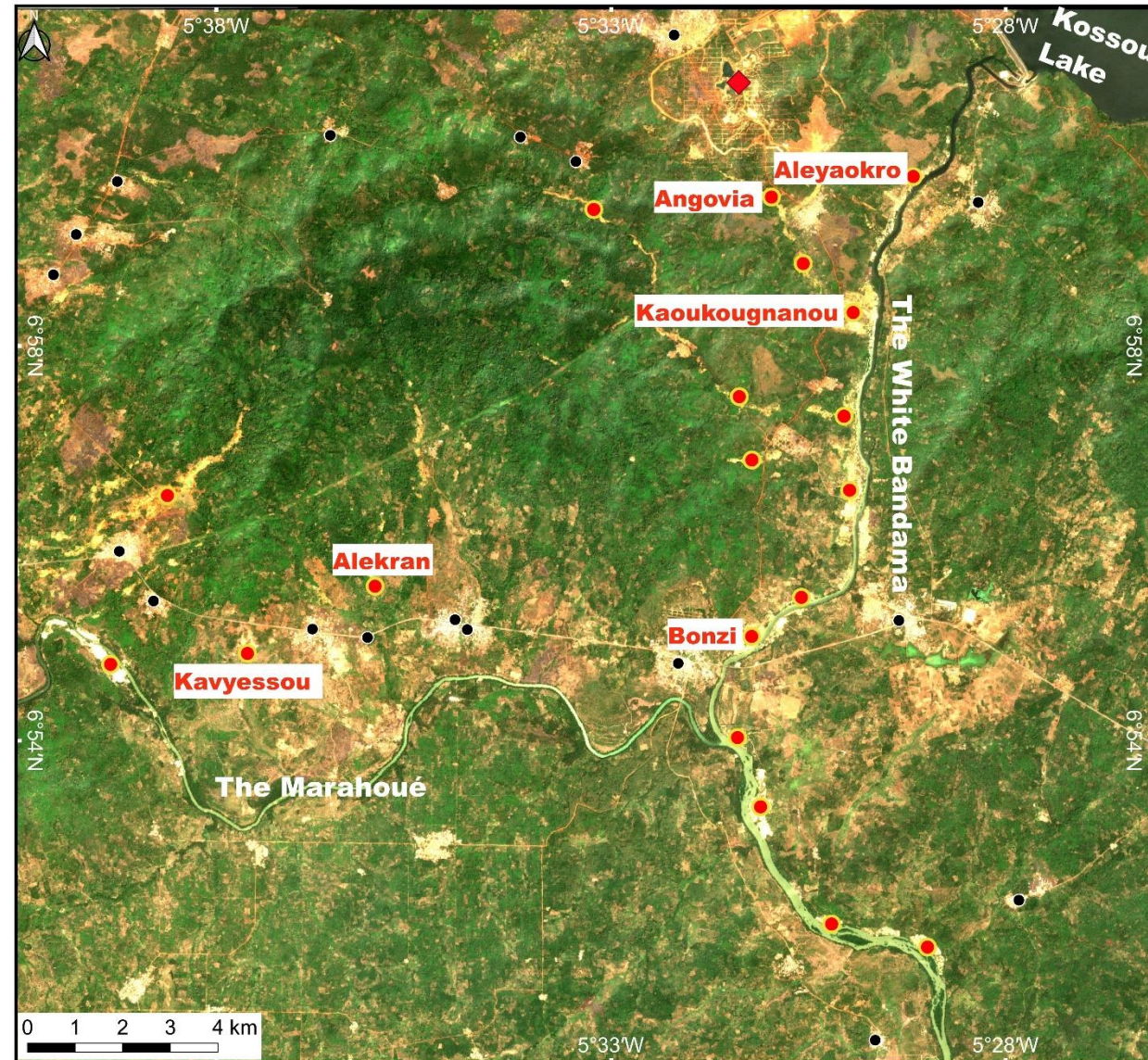
- ❑ **Detection, identification, follow-up / monitoring of sites** (Ngom et al, 2020; Gond et al. 2004; Laperche et al. 2008; Elmes et al. 2014; Gallwey et al. 2020; Asner et Tupayachi 2016; Almeida-Filho et Shimabukuro 2000; Lobo et al. 2018; LaJeunesse Connette et al. 2016; Le Tourneau et Albert 2005; Ngom et al. 2022).
- ❑ **Deforestation** (Rahm et al. 2014; Schueler et al. 2011; Poudori et al. 2001; Caballero Espejo et al. 2018; Diringier et al. 2020; Asner et Tupayachi 2016; Asner 2009; Swenson et al. 2011)
- ❑ **Soil degradation and acid mine drainage** (Almeida-Filho 2002; Telmer et Stapper 2007b; Lobo et al. 2016; Abass Saley et al. 2021; Seifi et al. 2019; Shahriari et al. 2013; Mielke et al. 2014)
- ❑ **Water pollution** (Lobo 2015; Gallay et al. 2018; Linares 2019; Lobo et al. 2018; Robert et al. 2016)
- ❑ **Spatio-temporal evolution** (Kusimi 2008; Manu, Twumasi, et Coleman 2004; Obodai et al. 2019; Snapir et al. 2017; LaJeunesse Connette et al. 2016; Isidro et al. 2017)

Detection, identification, monitoring and surveillance of sites: case studies of Senegal and Ivory Coast



Development of artisanal gold mining along the Bandama River (Côte d'Ivoire)

Ngom et al. (2022)

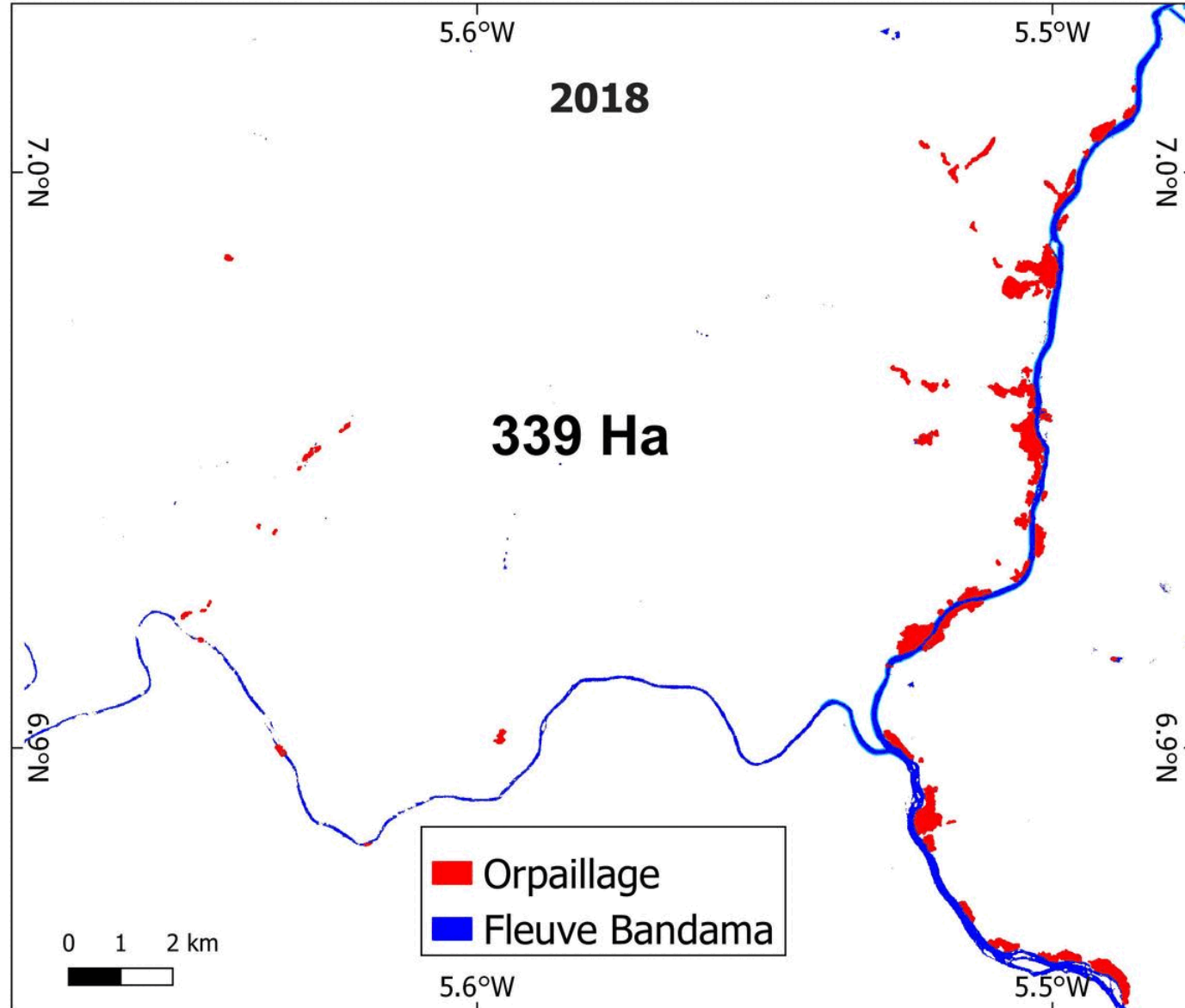


● Sites d'orpillage ● Villages ◆ Mine d'Angovia

■ Végétation ■ Orpillage ■ Fleuve ■ Habitats ■ Sol nu

Recent expansion of artisanal gold along the Bandama River (Côte d'Ivoire)

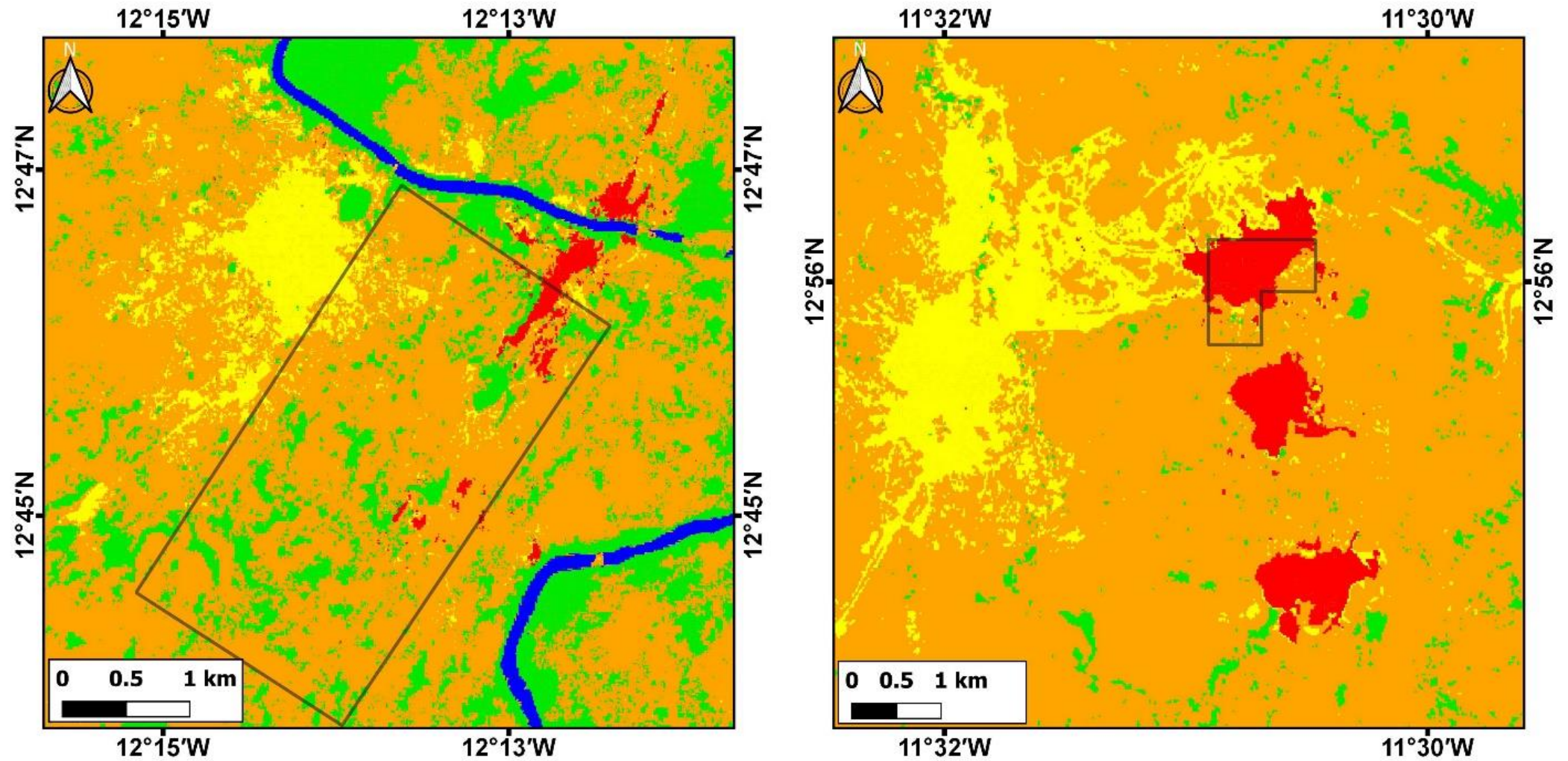
Ngom et al. (2022)



Expansion de l'orpillage entre 2018 et 2021

Identification and mapping artisanal gold mining sites in Senegal

Ngom et al. (2020)



Légende:

■ Végétation

■ Orpailage

■ Fleuve

■ Habitats

■ Sol nu

□ Couloir officiel

Development of a real-time monitoring tool for gold mining sites in Senegal

ASGM Watch

Google Earth Engine

Search places and datasets...

Décembre 2015

Actuellement

Surveillance des activités d'orpaillage au Sénégal

Cet outil a été développé pour la surveillance de l'orpaillage au sein et en dehors des couloirs officiels qui ont été définis par l'Etat du Sénégal. Ces couloirs officiels sont délimités par les bordures en rouge. Les données Sentinel-2 ont été utilisées. La haute résolution spatiale et temporelle de ces données permet de détecter les changements à l'état de surface liés à l'orpaillage et de suivre l'évolution des zones exploitées depuis décembre 2015

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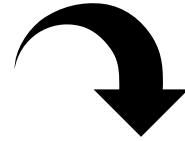
Liste des couloirs d'orpaillage officiels du Sénégal

- BANTAKOKOUTA
- BALANKONKO
- BAQATA
- BONDALA
- DAOROLA
- DIABOUGOU

Raccourcis clavier Données cartographiques ©2022 Conditions d'utilisation

Governance of gold panning informed by remote sensing observations: social and ethical aspects

For the governance of the mining sector, it is true that remote sensing will certainly not answer questions related to gender issues, labor relations, insecurity on mining sites and migration, which are all inclusive parts of the process....



- ❑ Using remote sensing in a reflexive manner that captures the social and political implications of gold mining governance
- ❑ Promote access to information and improve knowledge across levels of government.

Remote sensing now allows for the identification of gold panning sites, the mapping of soil degradation, deforestation, the characterization of sediment discharges into rivers, and the short- or long-term mapping of the expansion of artisanal gold mines and their waste.



Thanks for your attention

