CROSS REGIONAL:
PILOTING WATER LEAK DETECTION USING AERIAL REMOTE SENSING
TECHNOLOGY

1. BACKGROUND

Water scarcity exists in many areas of the EBRD’s Countries of Operation and with climate change is likely to become more acute. For many water operators, too, the amount of water available which is physically lost in the buried network is also very high. These losses are environmentally wasteful, can cause significant service interruptions to customers but also result in high economic losses for the network operator too. This illustrates the need for quick and cost effective methods and techniques of water leak detection. Traditional field survey methods for the detection of water pipeline leakages are costly and time-consuming. Conventional ‘on-ground’ techniques used to detect water pipeline leakage include acoustics, radioactive, electromagnetic, Ground Penetrating Radar etc. Increasingly satellite imagery has been commercially developed to discover water leaks remotely with no knowledge of the network and with the assistance of artificial intelligence can predict where new leaks could also occur (i.e. determine network vulnerability). As far as the EBRD is aware, this approach has never been trailed or tested through any of its infrastructure projects as the remote sensing approach is very new but is commercially available. However, there is a possibility that Governments, municipalities who own water assets and/or utility operators may have explored this potential outside the EBRD’s projects.

Addressing water losses through conventional methods is a common feature of water infrastructure projects where this is unacceptably high. In the EBRD’s experience resolving water losses negates or delays capital intensive supply side measures such as developing new water resources and protecting the environment. More importantly the water saved allows water services to be extended to serve wider communities, this assures a more sustainable use of the available water resources. Addressing which water mains to fix – under the conventional methods - tend to rely on creation first of sound water network models, the tactical installation of flow and pressure monitors such that the configuration and dynamics of the network can be better understood; this is in advance of narrowing in on where the water leaks might actually occur within discrete, closed areas of the buried network. These models, sensors and systems need continual management and maintenance in order to be reliable. The EBRD is exploring how the private sector could potentially help reduce non-revenue water (physical and virtual water losses) in Romania through a contracted services arrangement which is incentivised according to water savings, in Constanta. That private arrangement would be with the EBRD’s Client, the utility operator RAJA, and the private contractor however the technical approach on offer remains conventional in form.

The outcome of this assignment would lead to more rapid, cost-efficient detection of water leaks on water distribution networks, for clients, compared with traditional approaches. This would lead to pinpointing exactly which parts of the below-ground water network would need rehabilitating (using satellite imagery combined with artificial intelligence algorithms) which is then translated into a prioritised water mains investments programme which the EBRD or other IFIs could finance. This presents a considerable efficiency advantage in the absence of network intelligence and systems management which is often lacking in our Countries of Operation, especially those in the EBRD’s early transition countries.
2. OBJECTIVES

The overall objective of the assignment (the “Assignment”) is to determine the effectiveness of satellite imagery techniques (remote sensing) in the identification of water leaks in buried networks/difficult to access infrastructure assets for use in investment planning and delivery. Specific objectives of the assignment shall include, inter alia:

- Establish the applicability/suitability of the satellite leak detection approach to the EBRD’s Countries of Operation;
- Confirm the effectiveness of the approach compared with traditional physical leak detection techniques; and
- Understand the enabling factors for optimal success; and
- Quantify efficiency and/or other tangible benefits.

3. SCOPE OF WORK

The Consultant will perform the following tasks:

Task 1: Objectively understand the technological and economic advantages and disadvantages of remote detection of water losses by satellite with other ground based and aerial based techniques available (supported by evidence);

Task 2: Reveal the conditions necessary for its optimal use (infrastructure asset characteristics, network size, operating conditions, environmental requirements, knowledge base and capacity of the operator, etc.) compared with more traditional ground based ‘find and fix’ techniques. This is aimed at establishing the circumstances (when, where and what) that satellite leak detection should be best considered);

Task 3: Demonstrate the benefits of remote satellite leak identification within a small trial area of a real network compared with ground-based conventional methods (applied to currently monitored and non-monitored infrastructure assets). The EBRD will identify a willing utility client prepared to be involved in such a pilot; additionally quantify the expected benefits:

Task 4: Confirm the efficacy of the method for i) indicating broad investment needs, ii) targeting active/tactical leak detection, iii) routine network monitoring/management and iv) its ability to predict forward investment planning needs (all using case studies);

Task 5: Show how the information acquired remotely and analysed is translated into an investment programme (showing additional investigations, monitoring and/or mains rehabilitation work), confirming the certainty/accuracy/reliability of the approach for tactical planning and forecasting investment requirements;

Task 6: Develop a Generic ‘Terms of Reference’ for including satellite leak detection for use in technical Feasibility Studies including a schedule of typical unit costs for services/deliverable;

Task 7: Report the method and findings of this study, prepare a short technical paper, presentation and a multimedia video (the latter for external publication).
4. IMPLEMENTATION ARRANGEMENTS AND DELIVERABLES

The duration of the assignment will be 6 months. The Consultant shall routinely report to David Tyler, Associate Director, Water Sector Specialist and Ebru Yildiz, Associate Director, Head of ESD Operations in EBRD London office.

Deliverables

Unless otherwise agreed with the Bank, the Consultant will produce in the course of the assignment the following reports:

Inception Report: Within 3 weeks of the assignment commencement the Consultant will submit to the Bank an Inception Report presenting the initial findings, with an emphasis on its findings having an impact on the time schedule, keys risks and factors affecting these Terms of Reference.

Draft Final Report: Within 3 months of the assignment commencement, the Consultant will submit a draft Final Report. The Final Report will include all deliverables as described in the Scope of Work and include: (i) an explanation of the remote sensing technology, methodology and its applicability; (ii) the cost and benefits of the approach for infrastructure leak detection (iii) the ability to generate meaningful, prioritised investment programmes from the data and information analysed; (iv) details of the case study area examined, (v) technical one/two page summary and other media material.

The Consultant will distribute the draft Final Report in English to the Bank for comments and will organise a joint meeting to present the draft Final Report (“Presentation”) with all parties at a mutually suitable location within two weeks after distribution of the Report.

Final Report: To be submitted within two weeks after the Presentation date by the Consultant, elaborating and reflecting all comments addressed during the Presentation, and including summary information on the Project and on the EBRD financed component.

Three physical copies of all reports in English are required also be provided to the Bank in electronic-readable format, in both Word and PDF.

4.1. Donor visibility

Given the assignment is funded through the EBRD’s donor funded technical cooperation programme, the Consultant will be required to support the Client to ensure visibility of these resources. Support on these visibility aspects can be obtained from the Bank’s Communications Department. Measures could include but not be limited to:

- All documents produced by the Consultant should mention donor support and bear the logo of the donor, if appropriate.