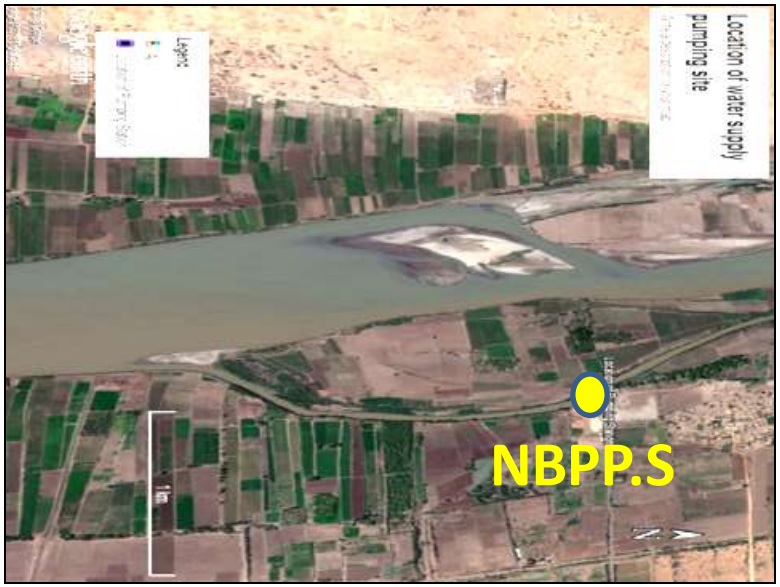
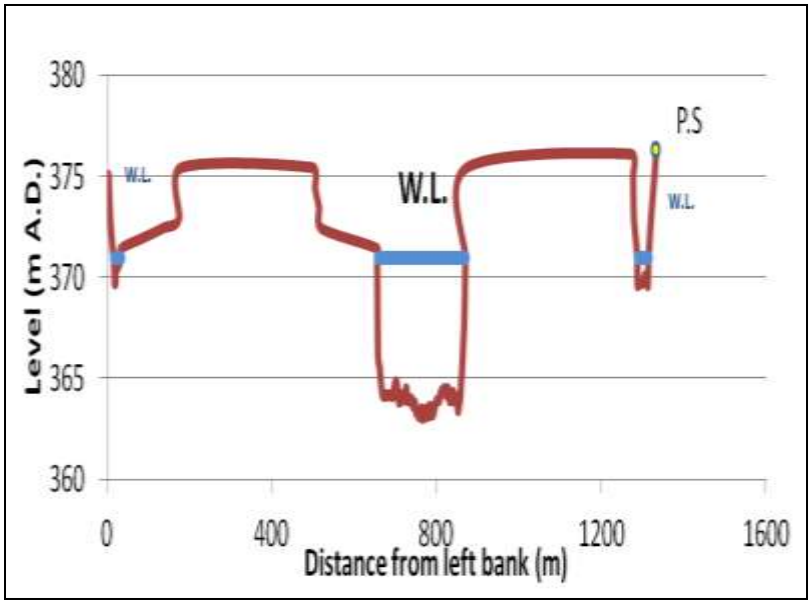
The suitability of the Intake of North Bahri - El Tamaniat Pumping site (NBTPS)





Hydraulics Research Center (HRC)

2nd Annual Scientific Seminar

Khartoum - 18th Dec. 2016

Presented by Dr. Ahmed A.I. Kabo

Introduction

❑Geographic location:

Right bank of the eastern branch of the main Nile south Tamaniat village.

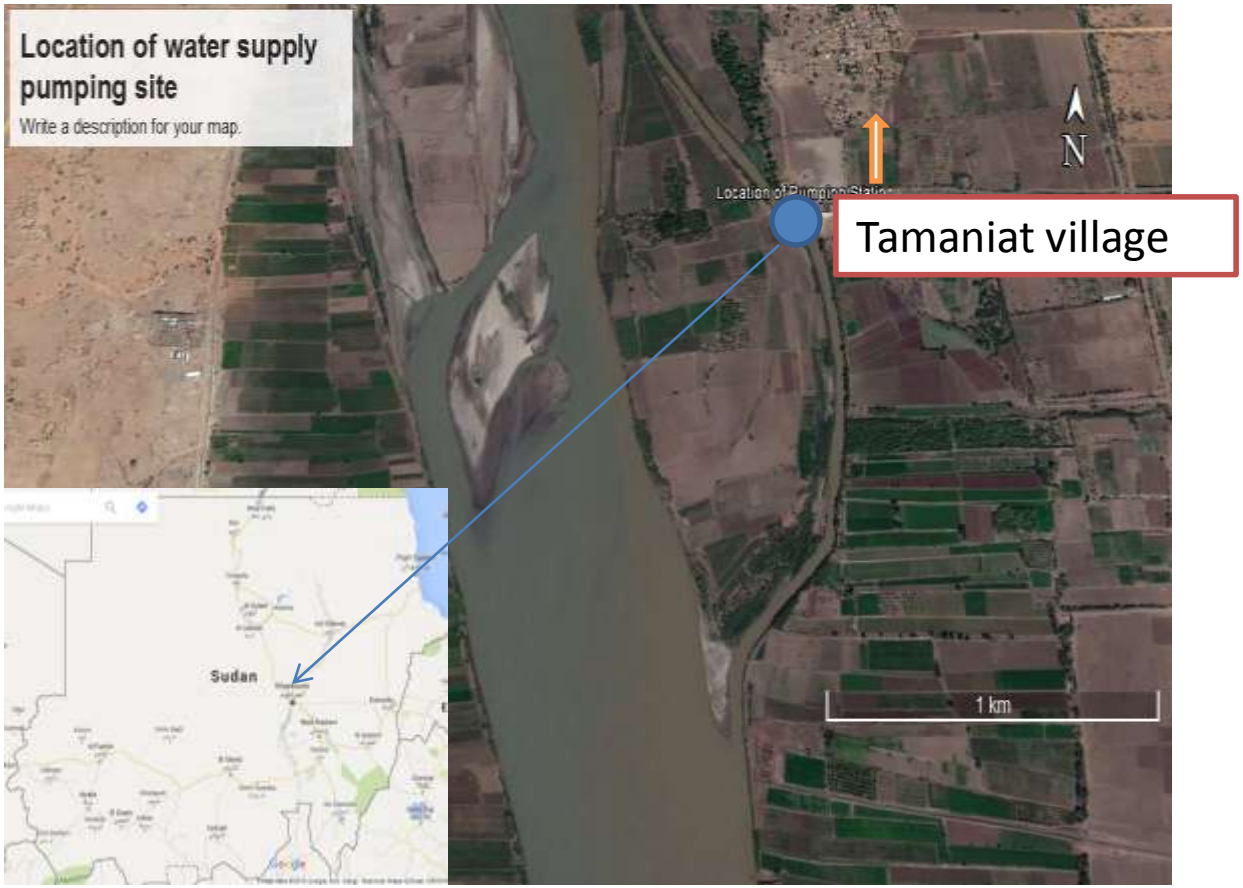
❑The client:

Khartoum State Water Corporation, “KSWC”,

❑The main objective:

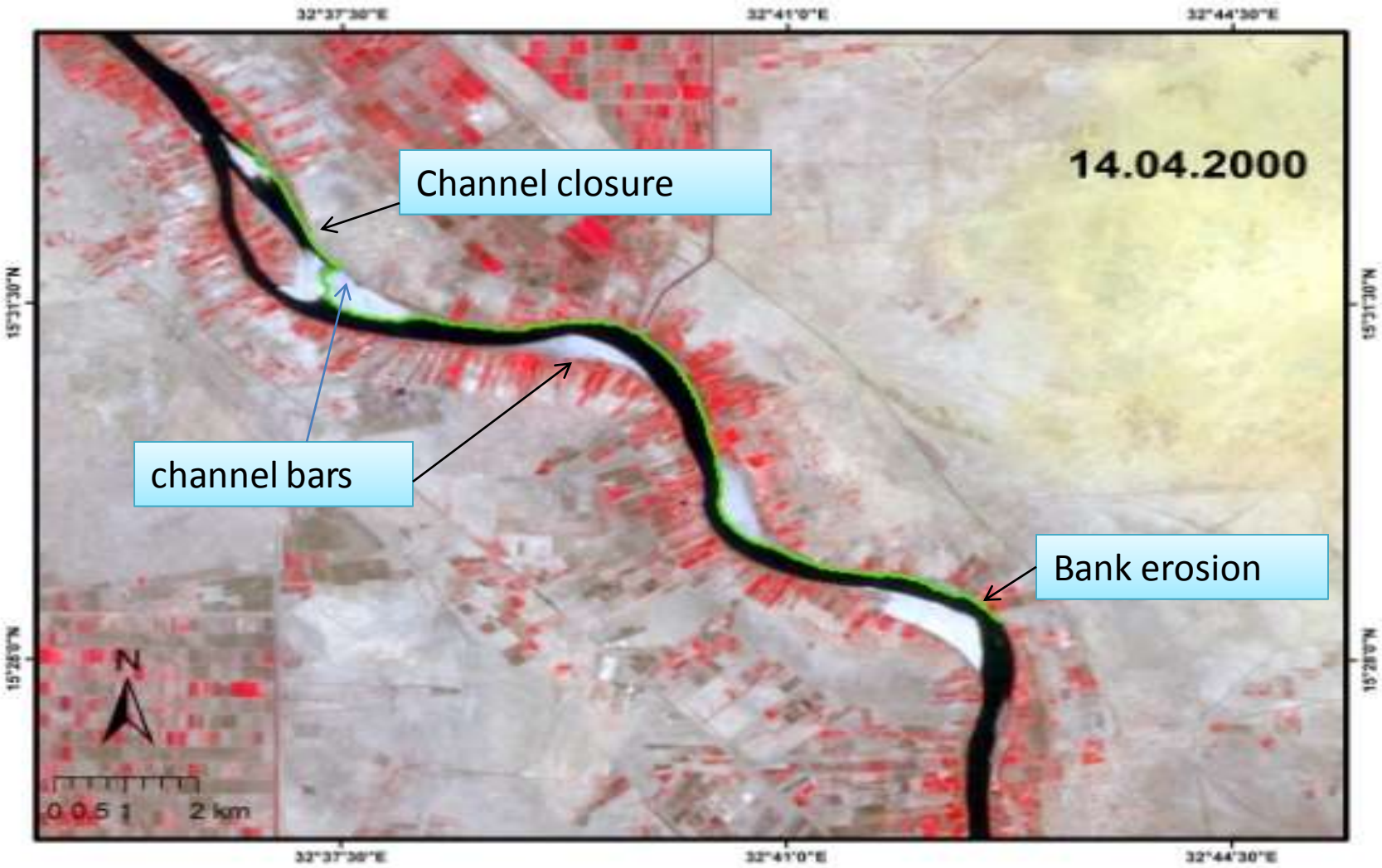
To recommend the possible mitigation measure(s) to alleviate the problem of water availability at the pumping site.

The location of the pumping station



35 km d/s the confluence white Nile and the Blue Nile.

Common river morphology problems at pumping sites



causes and /or accelerating factors of the morphological changes in rivers

- **Hydrological factors:** ***(physical behavior of the natural streams)***

✓ **Drainages basin characteristics;**

✓ **River hydraulics and sediment transport;**

✓ **Planform.**

- **Bank and bed formations:**

✓ **Soil type, bank shape and vegetation.**

- **Human interference:**

✓ **Change in the flow characteristics,**

✓ **Protection structures,**

✓ **Dredging.**

Contents of the main report

- 1 Introduction;
- 2 description of the study site;
- 3 Hydrological analysis;
- 4 Field surveys and consultations;
- 5 River Morphology study;
- 6 The impact of upstream developments on the Blue Nile system;
- 7 Possible interventions actions;
- 8 Conclusions and recommendation;
- 9 Annex : Cross sections and water levels;

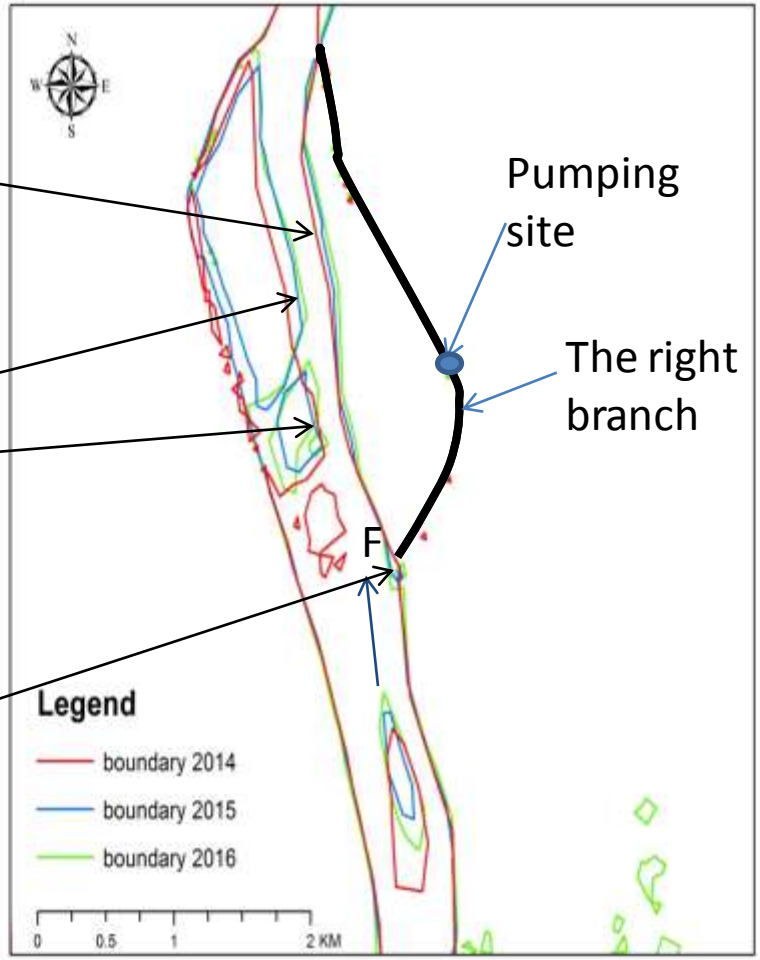
Methodology followed

- historical Satellite images for the Morphological changes
- Tamaiat *(1970 - 2012)* and Tabya *(2008 - 2014)* gauging stations data for the hydrological analysis.
- Land and bathymetric survey *(12 cross sections);*
- Hydrological analysis formulae available in the literature and models;
- Personal contacts *(mainly farmers and fishermen).*

Observations and main results

(1): morphological changes.

- ❑ Erosion on the left bank;
- ❑ Main channel changes
- ❑ Development Of sand bars



Observations and main results

(2): un stability of the right bank of the river.

1/ Heavy erosion on the left bank of the island in front of the Station.

2/ heaps of dredged sand at the inlet of the right branch.

Observations and main results

(3): stability of the left bank within the reach under study.

1/ A mountain on the Left Bank furthers downstream the Station

2/ stiff clay and rocks opposite to the pumping station

Observations and main results

(4): changes in right branch

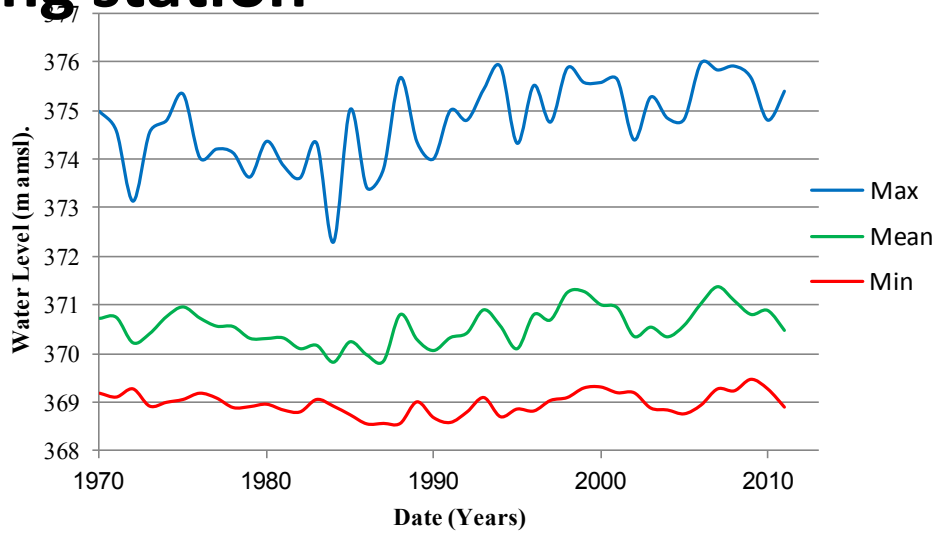
Pumping site location (2009)

Pumping site location (2016)

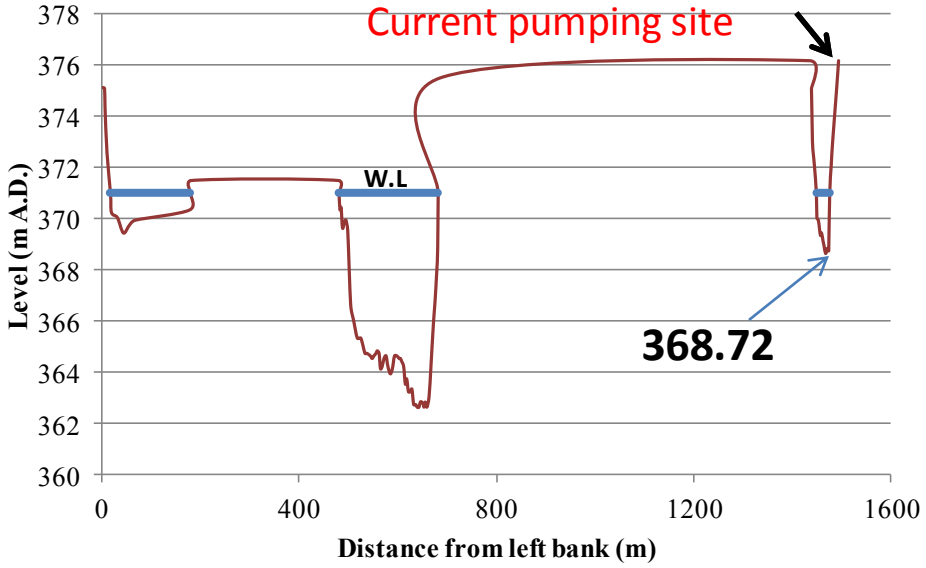
Observations and main results

(5): Cross section and water levels at the center line of the pumping station

water levels at Tamaniat gauging station (3 Km d/s the NBTPS)



Cross section at the center line of the NBTPS



Main results:

- The right branch is decreasing (34 m/year).
- Minimum bed level of the right branch is about 6 m above that of the main channel;
- the 50 years return minimum water level is lower than the minimum bed level of the right branch;
- The GERD will increase the minimum water level by about 0.5 m.
- Earlier the branch under study was the main river. (official reports and personal communications).

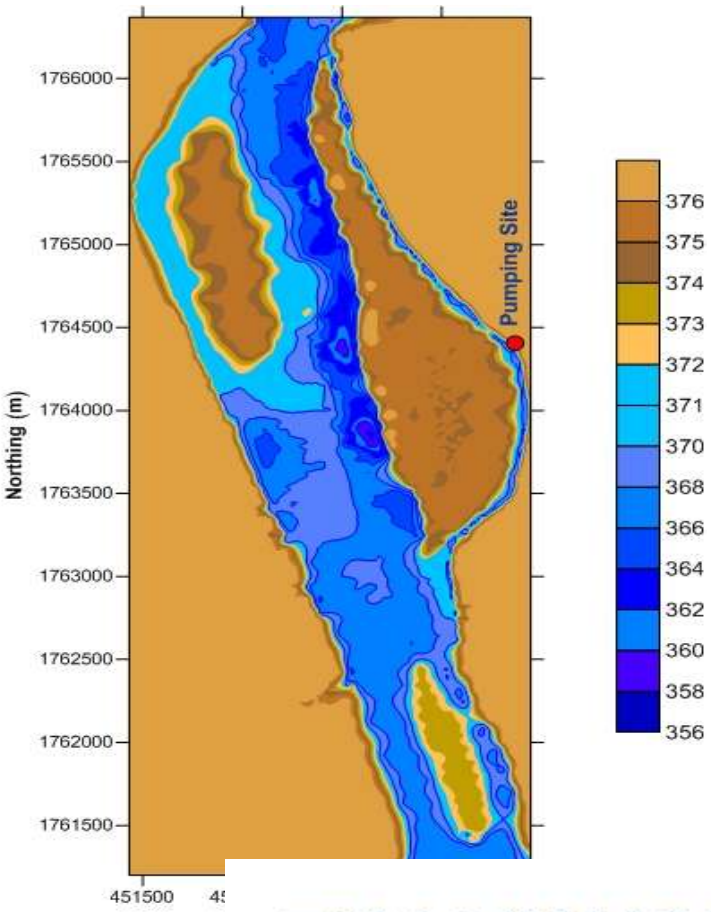
Main conclusions

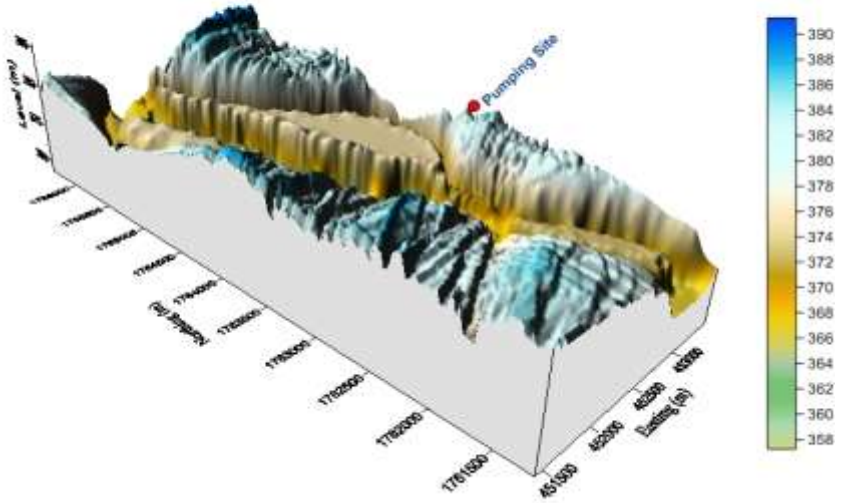
- The study area is unstable, *(the major changes occur on the right bank)*
- The river branch under study approaching complete closure;
- The enhancement from the GERD is negligible;
- The current dredging practice is a temporal solution with negative impacts, (accelerates siltation downstream);
- Other options of pumping sites exist *(feasibility study is necessary);*
- Physical model and further detailed studies are necessary for the determination of the most suitable pumping site.

recommendations

- Own a floating dredger to continue the current practice;
- Transfer the pumping site to the right bank of the main channel *(about 1 km from the current site across the island);*
- Move pumping site about 2.0 km upstream the existing site;
- Conduct a detailed study for the area under concern for the determination of the best location.

وشكراً على حسن الإستماع





THANK YOU FOR YOUR ATTENTION