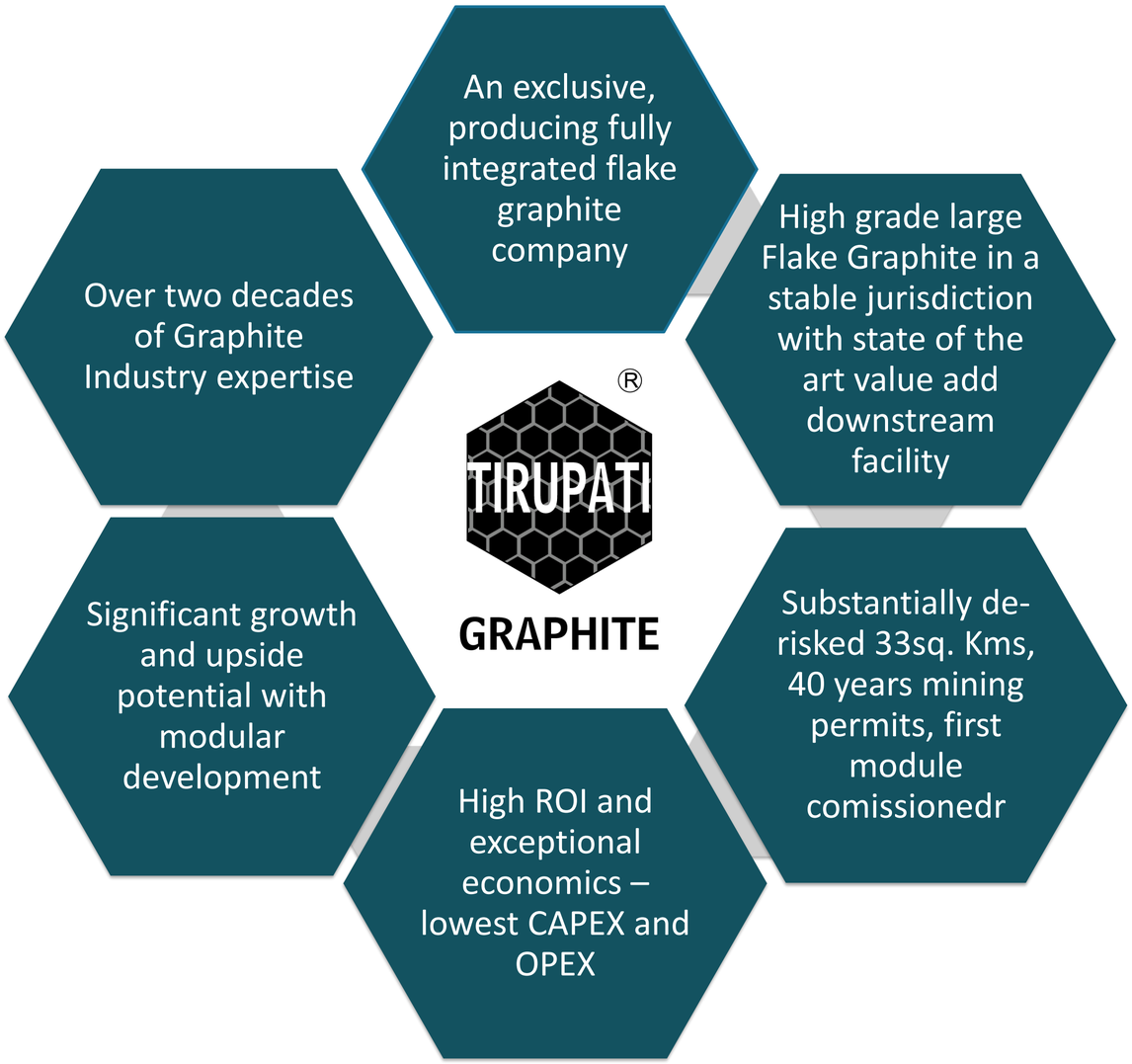
TIRUPATI®

GRAPHITE

# TIRUPATI GRAPHITE PLC

Developing an end to end one-stop solution
Company for Graphite & Graphene

# Our Company is Unique




We believe in and practice sustainability in all spheres – environmental, relationships and value creation

# Our Sector

Natural Flake Graphite & Graphene

A crystalline form of Carbon

A solid state lubricant

Once intercalated, expands many-fold at onset temperature

Only non-metallic conductor

Sustains temperatures of >3000˚c

Graphene is an atom layer of flake graphite

- Flake Graphite is a critical resource it has over 150 different applications and is a supply threat
- We understand it is user specific on standardisation and needs personalised customer service
- We offer a stable Flake Graphite source with ongoing partnership with our customers, backed by a competent team with decades of operations experience

# Flake Graphite | More than a resource

## A special material with a long value chain

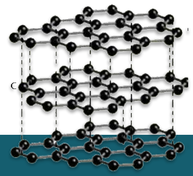
**PRIMARY**

- Product is flake graphite concentrate, up to 96% purity of different flake sizes
- Mining followed by basic milling and floatation
- Supplied directly to applications or raw material for downstream processing

**DOWNSTREAM**

- Flake graphite concentrate is subjected to further processing for high purity, expandable, micronized and spherical graphite

**GRAPHENE**



- The wonder material – **Graphene**
- A single layer of flake graphite
- Can be made using flake graphite
- Multiple applications being developed and researched

# Applications

Natural Flake Graphite has 150+ applications:

TIRUPATI® GRAPHITE

Most applications of graphite are destructive, hence continued consumption:

| Large Flake 20-50# | Medium Flake 50-80# | Small Flake <80# to micronized |
|---|---|---|
| Con-cast refractory | Basic refractory | Paints & coatings |
| Crucible B. F. bottom plates | Magnesia carbon | Pencils |
| Gaskets & seals | Alumina carbon | Dry & Ni MH battery |
| Expandable Graphite | Unshaped Refractory | Lubrication |
| Flame retardants | Flame retardants | Friction materials |
| Thermal sheets | | Foundry |
| Fuel cells | | Composites |
| Plugging agents | | LiB battery |
| Graphite foils | | Space technology |

Normal growth: 2-4%

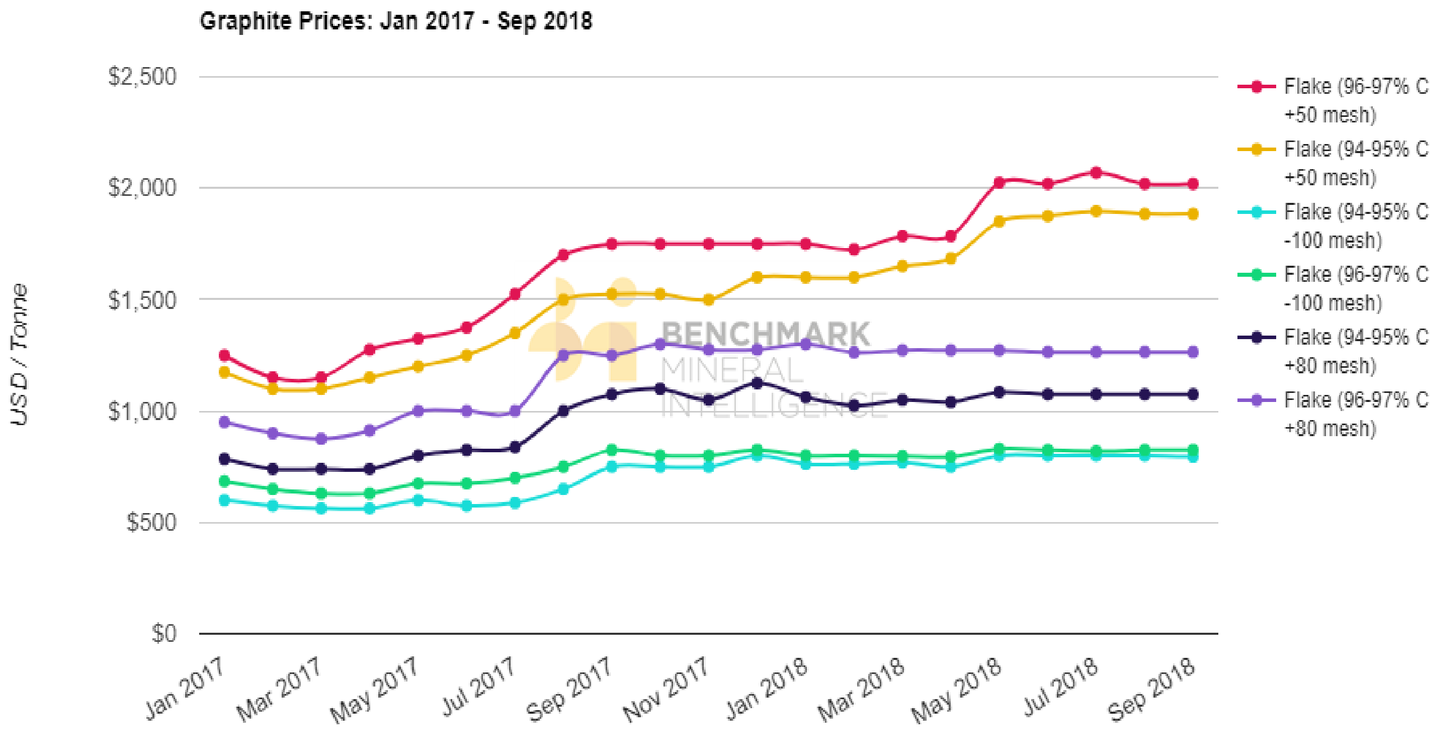
Moderate growth: <6%

High growth: >6%

There is a bit of invisible flake graphite in your day to day life.

# Robust demand

Flake Graphite prices increasing




- Graphite **prices increasing** across all flake sizes
- **Premium on large flake** graphite continue to improve due to **supply pressure**
- Environmental cuts and **closures of Chinese sources**
- Consumers preference to **diversify sources**
- Growth due to high demand for multiple applications, in particular Li-ion batteries, fire retardants, foil and thermal management etc.
- Classified as a **critical resource** by the United States and European Union

Source: SP Angel Industry Research,

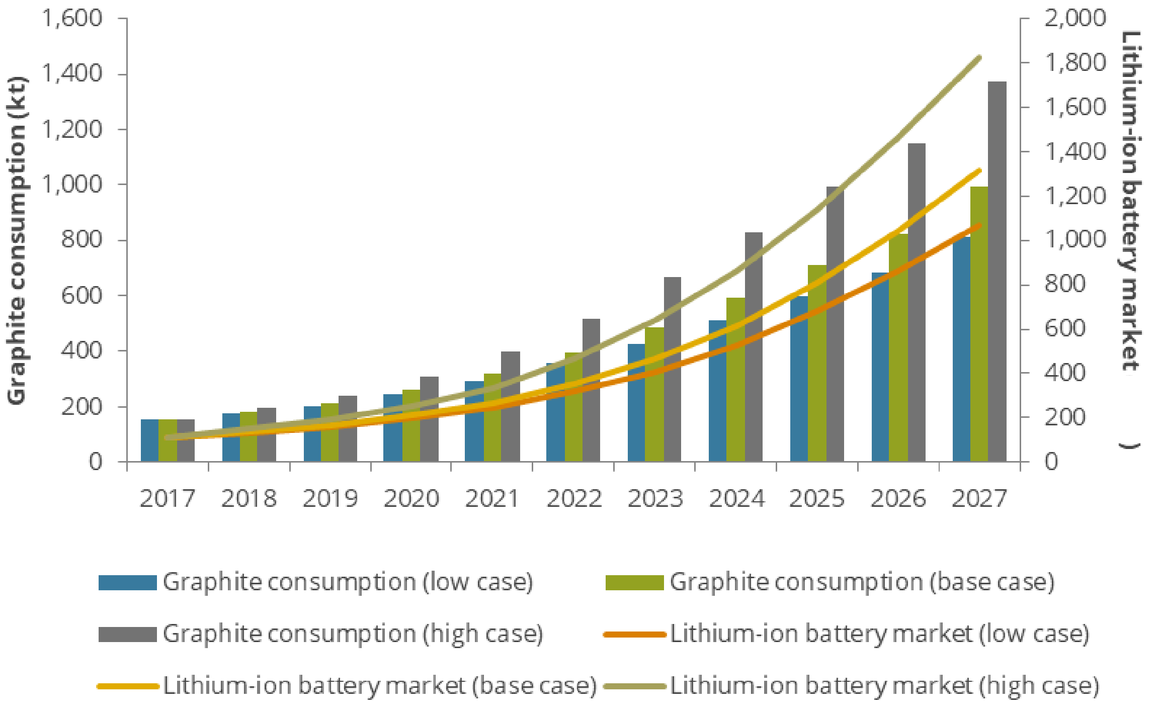
Tirupati Graphite is well positioned in all market segments backed by decades of experience

# Li-ion Batteries

Highest Growth Market for Graphite

TIRUPATI GRAPHITE

- Every **100 GWh** of LiB capacity requires approx. **100,000 tons of natural flake graphite**.




*Source: Roskill*

- Li-ion batteries used in **energy storage and EVs - 3 times more Graphite than Lithium used.**
- Multiple companies like **Tesla, Volkswagen, Volvo, Ford, Maruti Suzuki etc., announced investments and plans for Li-ion battery based EVs.**
- **Multiple companies like CATL, BYD, Panasonic, Samsung, LG Chem etc., are producing and further enhancing Li-ion capacities.**

Li-ion battery Mega factories: 372GWh by 2021, > 1000GWh by 2027

# The Projects

Integrated from Mine to downstream to Graphene

TIRUPATI® GRAPHITE

**VATOMINA PROJECT - Mining & Primary processing up to 96% purity**

**TIRUPATI SPECIALITY GRAPHITE PVT. LTD - high purity, expandable, fire retardant, micronized & spherical**

MADAGASCAR

TIRUPATI® GRAPHITE

INDIA

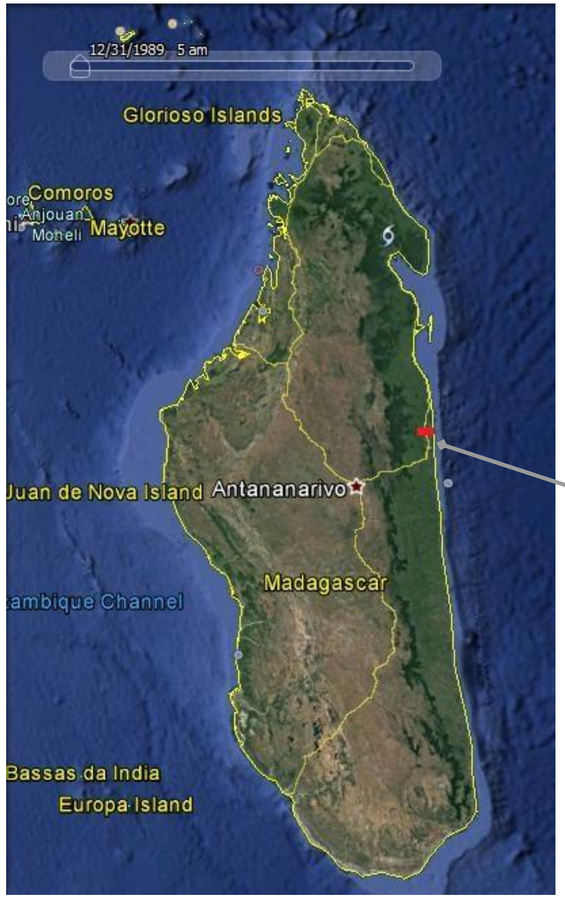
**SAHAMAMY PROJECT - Mining & Primary processing up to 96% purity**

**TIRUPATI GRAPHENE & MINTECH RESEARCH CENTRE - Graphene production and application development, technology support**

T G M R C

Bhubaneswar, India

# Madagascar by Choice | For Flake Graphite Mining and Processing



- ✓ Infrastructure ready projects
- ✓ Connected to the national highway - less than 2 hours to Tamatave port
- ✓ Mining permit for 33 $km^2$ area issued 40 years (fully permitted) and renewable
- ✓ Highly experienced in-country management capability
- ✓ Support of Madagascar government and local villagers and their leadership
- ✓ Conducive mining law in a stable jurisdiction, supportive to investment
- ✓ Well located on the globe with proximity to all consuming centres – Europe, America and Asia

Tirupati is recognized as a one of the leading companies in Madagascar

# Tirupati in Madagascar | For Flake Graphite Mining and Processing

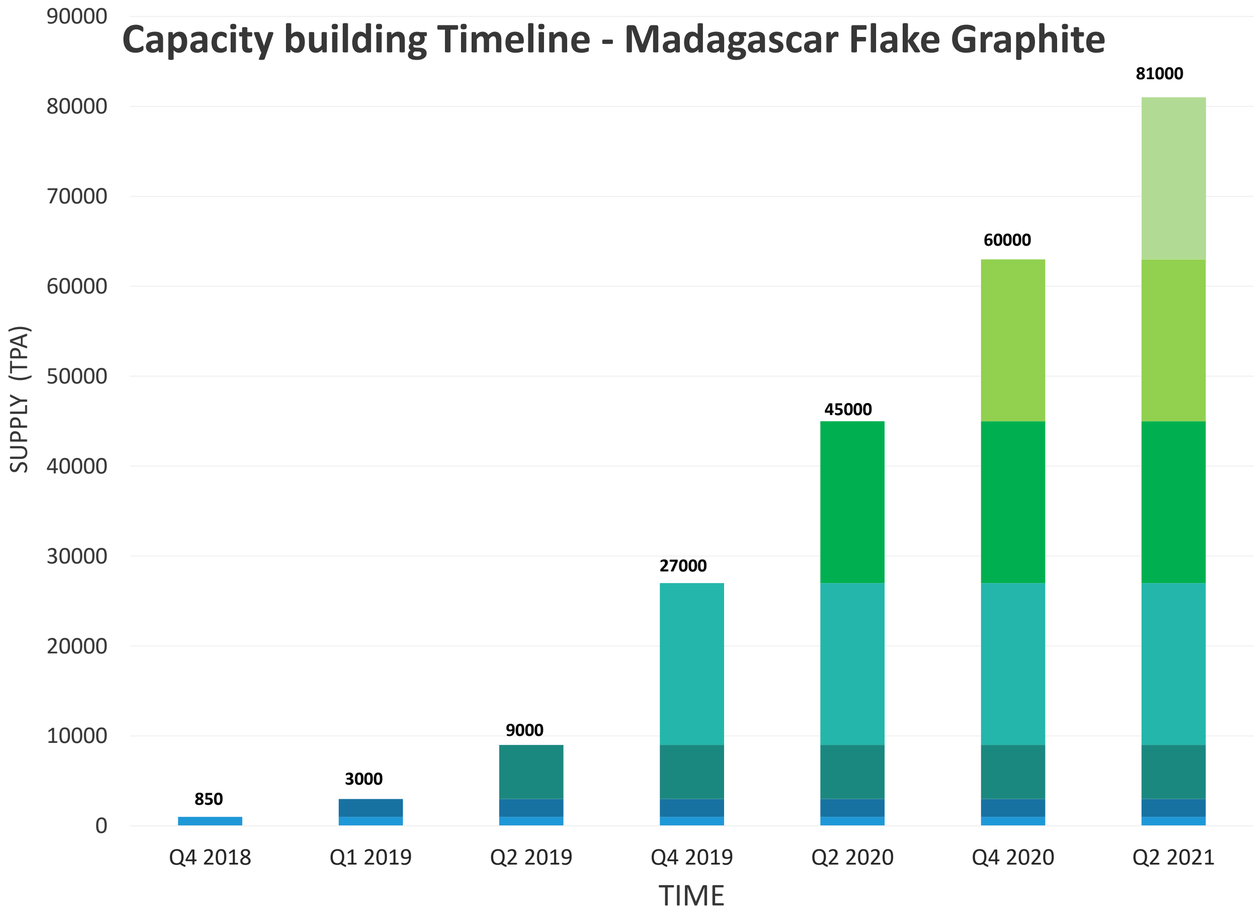
TIRUPATI® GRAPHITE

## 1 Premium quality flake graphite, feasible resource

- high concentration of jumbo and large flakes
- highly crystalline molecular structure.
- Free dig mining, easy liberation.
- a lean cost effective process.
- First plant commissioned and in production.

## 2 Growth Strategy based on Modular Expansion

- First 3000 TPA module commissioned.
- Second 6000 TPA module under construction.
- Further modules of 18000 TPA standard size
- Reduced risk profile.
- Early cash flows
- End user driven Market development.



# The Vatomina Project

For Flake Graphite Mining and Processing

TIRUPATI® GRAPHITE

- 25 $km^2$ 40 years mining permit
- 6,000 TPA plant under construction
- Cash flows start Q3 2019
- 3X18000 TPA plants to follow
- Total planned capacity 60,000 TPA
- Over 6 $km^2$ mineralised area
- First phase 63 diamond core drills completed.
- Updated CPR to be released.

The project was acquired from TCCPL in May 2017 along with the team, technology, project plans and the brand value.

# The Vatomina Project

Key Developments in pictures:

Base Camp, Internal Bridge, Roads and plant infrastructure under construction

Diamond core drilling rig, exploratory  mining, core sample

# The Sahamamy Project

For Flake Graphite Mining and Processing

- Old operating project acquired January 2018
- Located at 8 km aerial distance from Vatomina
- 8 $km^2$ mining permits for 40 years.
- New 3000 TPA first plant commissioned
- Further plants in 18000 TPA modules to be established
- Product circulated in markets.
- Maiden JORC CPR with following resources released
  - Indicated – 02.9M Tons @ 5.5% GC
  - Inferred – 10.7M Tons @ 5.5% GC
  - Potential – 15.1M Tons @ 5.0% GC
- Further exploration to be conducted by core drilling.
- Own drilling rig provides cost leverage

# The Sahamamy Project

Key Developments in pictures:

An operating project project – mining processing supporting education with infrastructure – Sahamamy brings us to positive cash flows

# Metallurgical Tests and Processing

- TG inherited technology, designs and plans for its projects.
- Further metallurgical and characterisation studies performed :
    - A lean process with higher purification, flake size retention and more productivity developed
    - achieved up to 96% purity, with 96% recovery.
    - Products supplied and tested for numerous applications

      Modular plant design of 18000 TPA developed for both projects
- TG establishes first plant using new and proven technology
- Process well established and commercially applied.
- Further capacities derisked for execution and performance risks.

# Product Basket | Flake Graphite Concentrate:

TIRUPATI® GRAPHITE

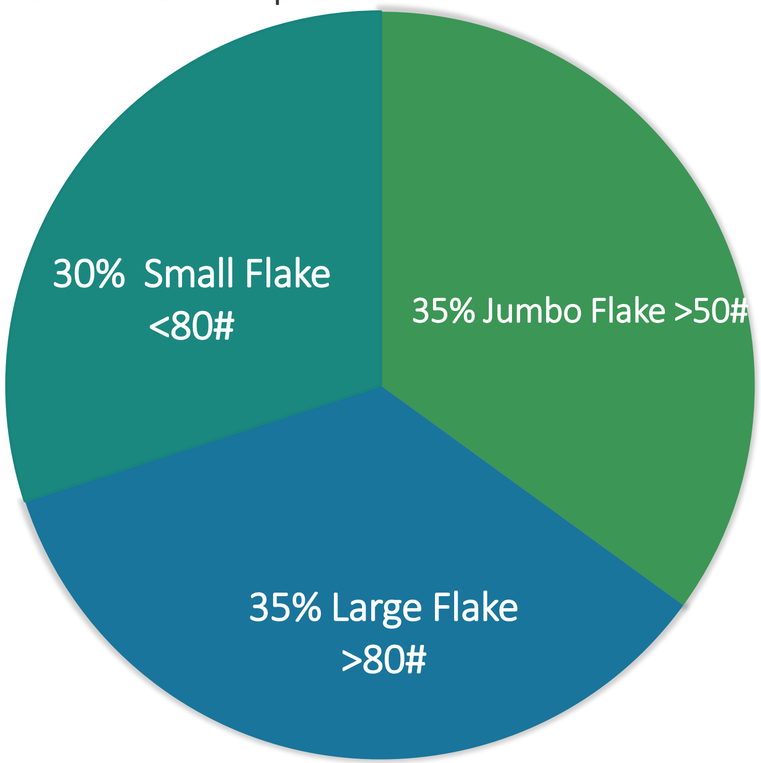
**We offer:**

- **Tailor made grades**

Our plants have extensive finishing facilities, accurate screening and blending to tailor our customer's specific requirements.

- **Standard range**

Designed based on our extensive understandings of the user industry domain.
Purity is by customer choice – up to 96% FC.




THE PARTICLE SIZE DISTRIBUTION – A DISTINCT ADVANTAGE

### Super Jumbo Flake Graphite >600M

- Rare Graphite Flakes representing the largest commercially available crystal size
- Flake size Guaranteed : 80% min > 30# (600 microns)
- Typically contains >20% Flakes of above 1 mm size

### Jumbo Flake Graphite >300M

- The most used premium large flake graphite
- Flake Size Guaranteed : 80% min > 50#

### Large Flakes >180M

- The large flake for varied applications
- Flake Size Guaranteed :- 80% Min > 80#

### Small Flakes < 180M

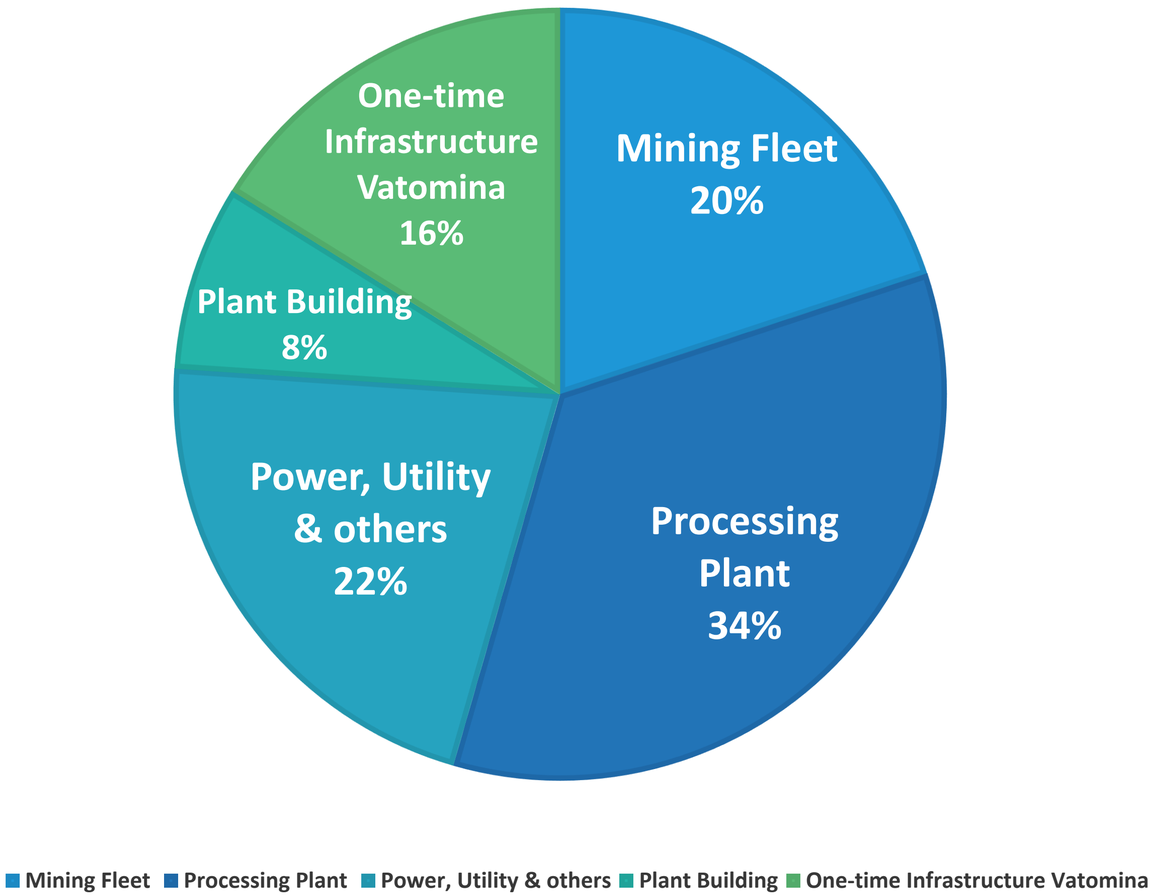
**The finer flake Graphite**

# Madagascar Projects Stage 1

July 2018 – October 2019

TIRUPATI® GRAPHITE

**CAPEX TO 27000 TPA PRODUCTION £6.22 MILLION**




- CAPEX per Ton Annual Capacity created £230 c $300 /ton capacity created.
- **Sahamamy Maiden JORC Resource Oct 2018**
  - Indicated – 02.9M Tons @ 5.5% GC
  - Inferred – 10.7M Tons @ 5.5% GC
  - Potential – 15.1M Tons @ 5.0% GC
- **Vatomina Interim JORC Resource**
  - To Release Q2 2019
- Staged Exploration investment with continued upside potential alongside production.
- Unique strategy with low investment
- Substantially de-risked organic growth .

# Tirupati Specialty Graphite, India

For Downstream Flake Graphite

TIRUPATI® GRAPHITE

1

High margin / low cost - average per ton EBIDTA estimated at > US$ 1000 per MT

2

Customizable to customer needs

3

Environment friendly non-HF purification process

4

A team of experts who have developed processes and successfully operated in this industry for decades.

5

Pilot scale fire retardant plant completed, substantially de-risks downstream project.

**1200 TPA fire retardant facility commissioned, product sampling ongoing**

# Tirupati Specialty Graphite | For Downstream Flake Graphite

TIRUPATI® GRAPHITE

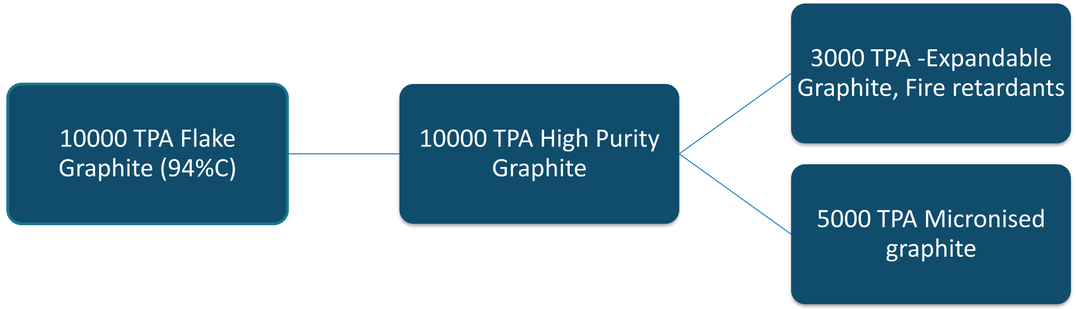
High Purity, Expandable, Micronized and Spherical Graphite for various applications

## 1 Logistical Advantage:

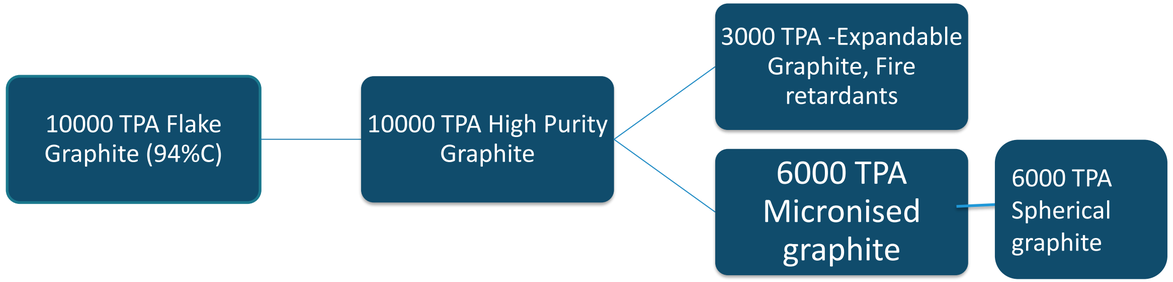
- Well developed industrial areas of Gujrat, all inputs available in the region from manufacturers.
- Availability of utilities required
- Government support and stability
- Logistically advantageous with good accessibility, nearby port.
- Skilled human resource readily available
- Lower production and operation costs compared to those in developed countries.

## 2 20000 TPA throughput:
Modular designs with ease of expansion.
Project to be developed in two phases

### Phase 1: 2019, 10000 TPA throughput




### Phase 2: 2020, 10000 TPA throughput added



# Tirupati Specialty Graphite | For Downstream Flake Graphite

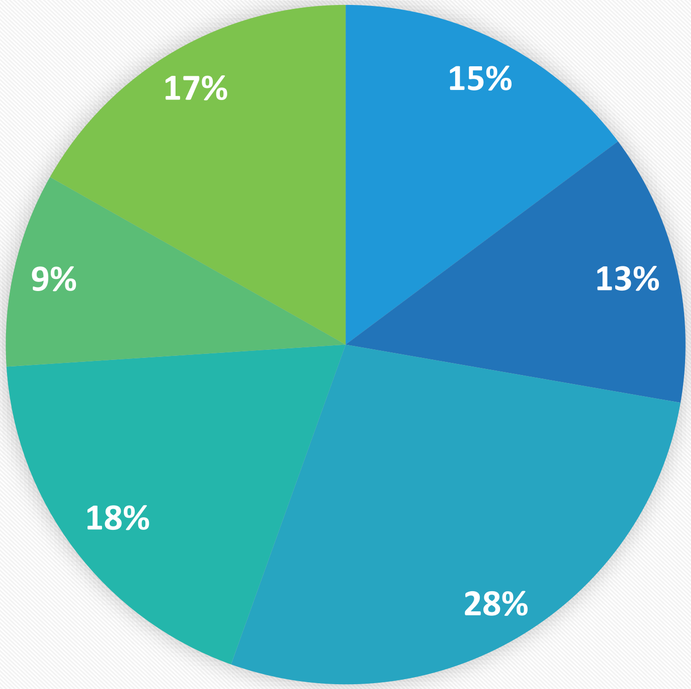
Proposed 20000 TPA plant & expandable as market demands
Phase 1 : £5.4 MN
Phase 2 : £6.8MN

| | Application Example | Illustrative market pricing * |
|---|---|---|
| Expandable Graphite – **6000 TPA** | • **Fire retardant**<br>• **Sheets & Gaskets**<br>• **Thermal management** | • **US$ 2500 to 5000 per ton** |
| Spherical Graphite – **6000 TPA** | • **Lithium-Ion Batteries** | • **US$ 3200 to 3700 per ton** |
| Colloidal and Micronized Graphite – **5000 TPA** | • **Lubrication**<br>• **Friction & Insulation**<br>• **Conductive polymers**<br>• **Composites** | • **US$ 2000 to 3000 per ton** |
| Graded high purity flakes – **3000 TPA** | • **High end refractory**<br>• **Graphene**<br>• **Input for other processors** | • **US$ 1750 to 3000 per ton** |

# Tirupati Specialty Graphite | For Downstream Flake Graphite

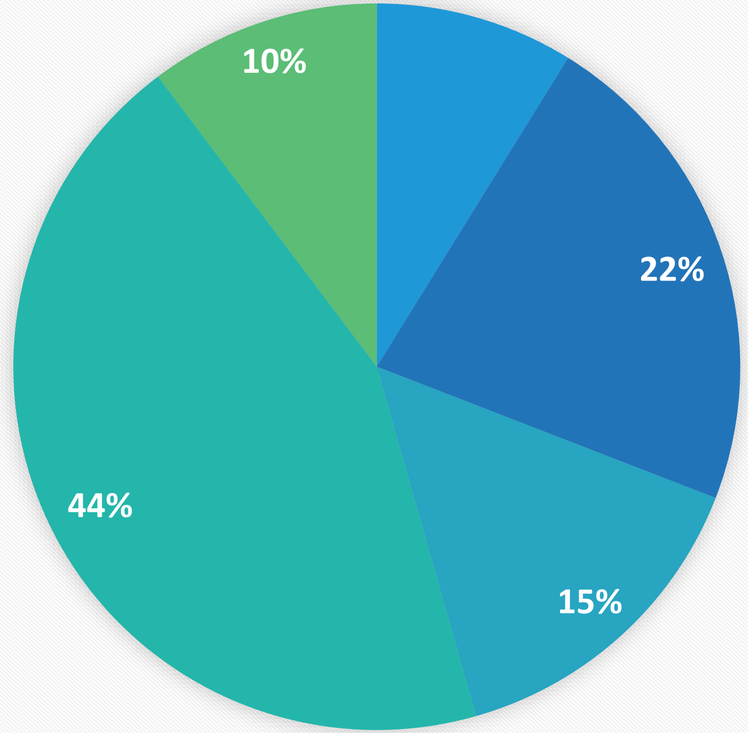
## CAPEX estimates for integrated downstream plant

### CAPEX Phase 1 : £5.4M




- Land & Development
- Civil Construction
- Purification Plant
- Epandable & fire Retardants
- Micronisation + Shaping
- Engineering Technology Utilities etc

### CAPEX Phase 2 : £6.8M




- Civil Construction
- Purification Plant
- Epandable & fire Retardants
- Micronisation, Shaping Colloids & Pellets
- Engineering Technology Utilities etc

# Tirupati Graphene and Mintech Research Center

Self-sufficient industry focused Graphene & technology centre

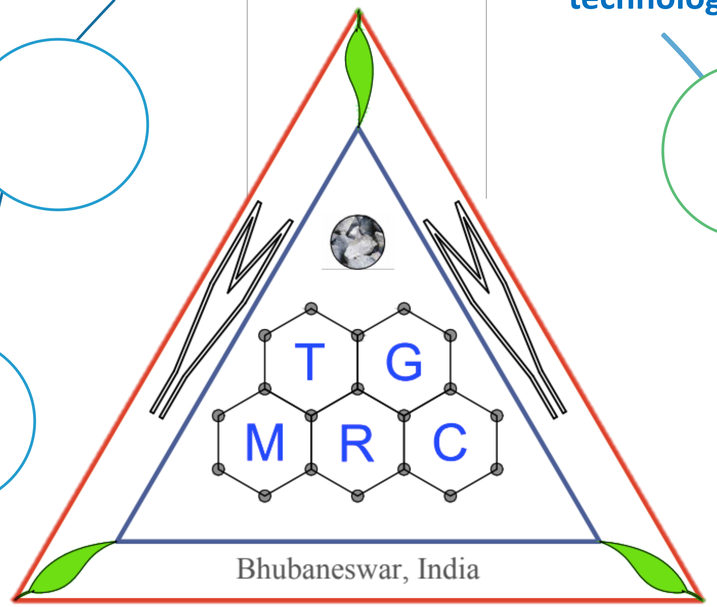
TIRUPATI® GRAPHITE

Completed a detailed feasibility study

## GRACE

**A center of excellence for graphene and specialty graphite technologies**

- Low cost Manufacturing of 10kg Graphene Oxide and Graphene per day for applications
- Graphite Application technology
- New age Graphene & Graphite Composites application development




## MINMET

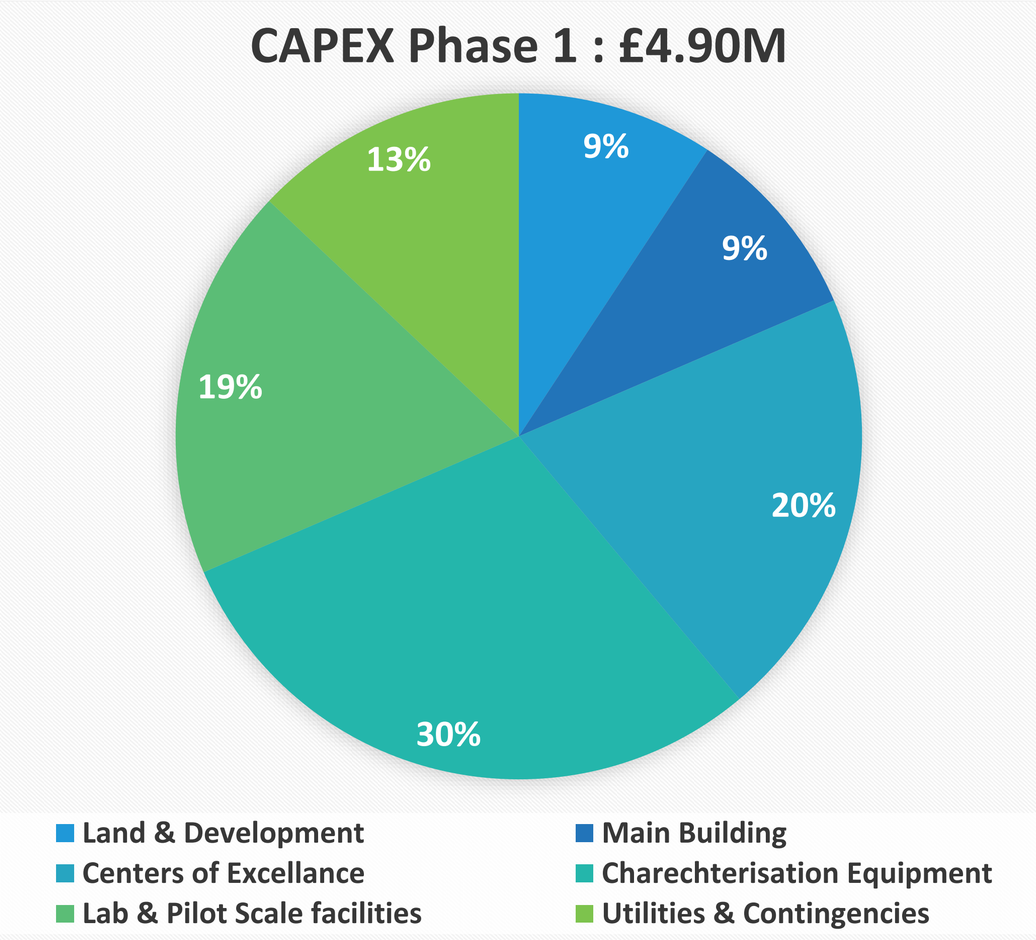
**Unconventional, cost effective and sustainable mineral processing technology - from exploration to production**

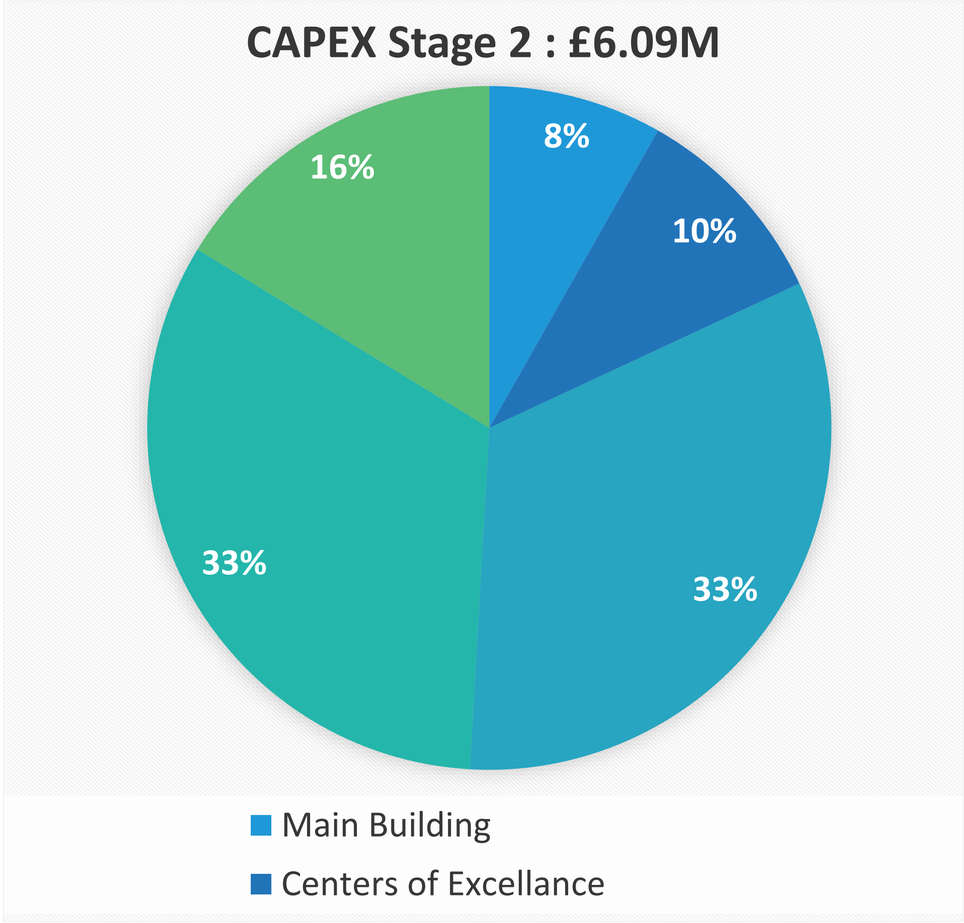
- Ongoing industry partnerships, Engineering and design Consultancy
- Technology development for lean grade ores
- Training and skill development
- Mineralogical and analytical studies

# Tirupati Graphene & Mintech Research Centre, India

TIRUPATI® GRAPHITE

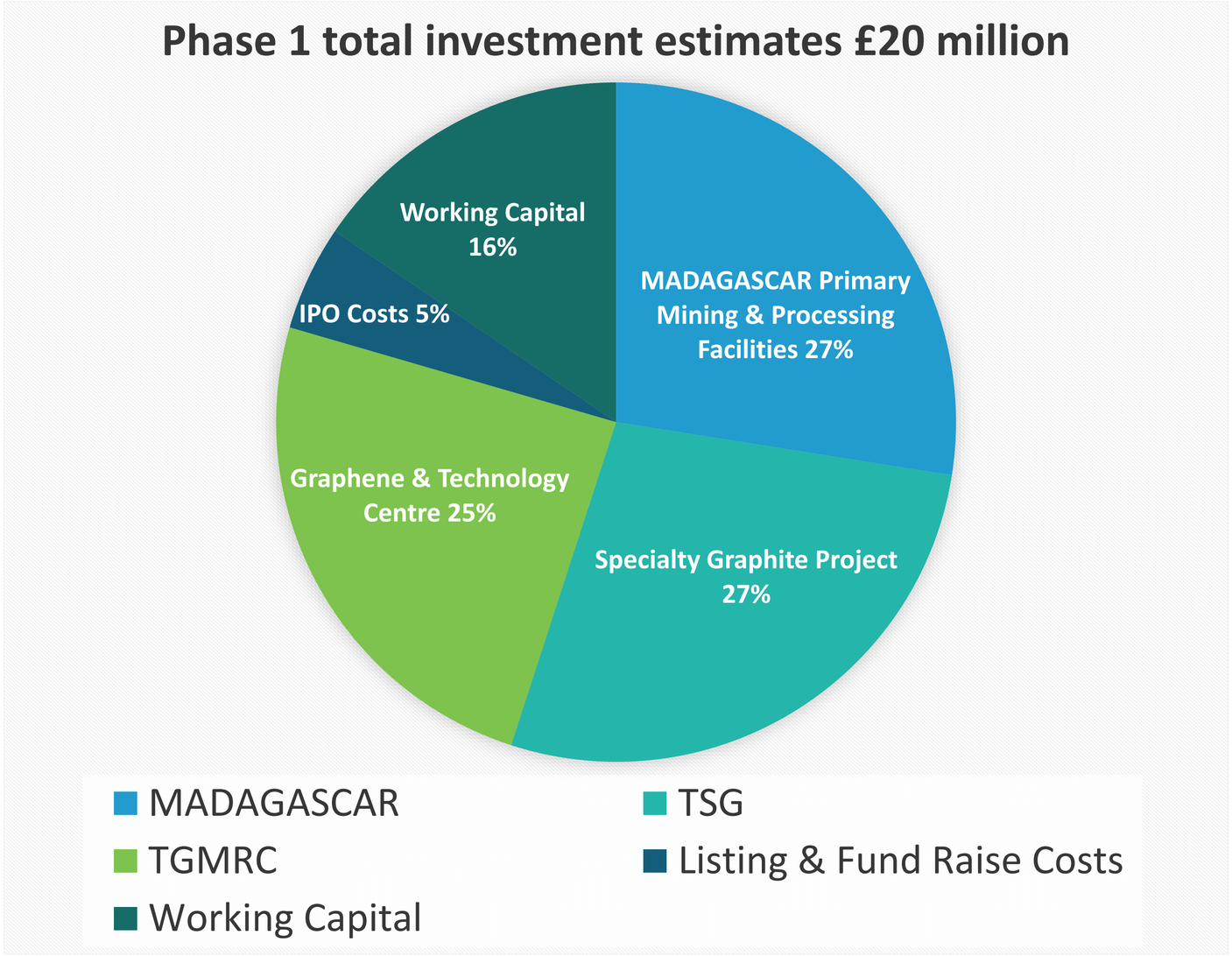
CAPEX estimates for Graphene & Technology Centre – providing a critical edge



# Utilisation of Capital 2018-19

TIRUPATI® GRAPHITE




- Capital raise may split in more than one part, up to mid 2019 by way of equity and debt combination.
- Liberty to leverage cash flows for debt funding.
- Minimised dilution for existing shareholders the target.
- Cash flows start early 2019.

# Investment Details

- Early staged cash flows to provide funding for on-going developments, following modular expansion.
- A long stream of value creation for upside investment and downstream products.
- Successfully raised pre-IPO funds to initiate developments.

# Our Guiding Values and Principles

## Principle of sustainability

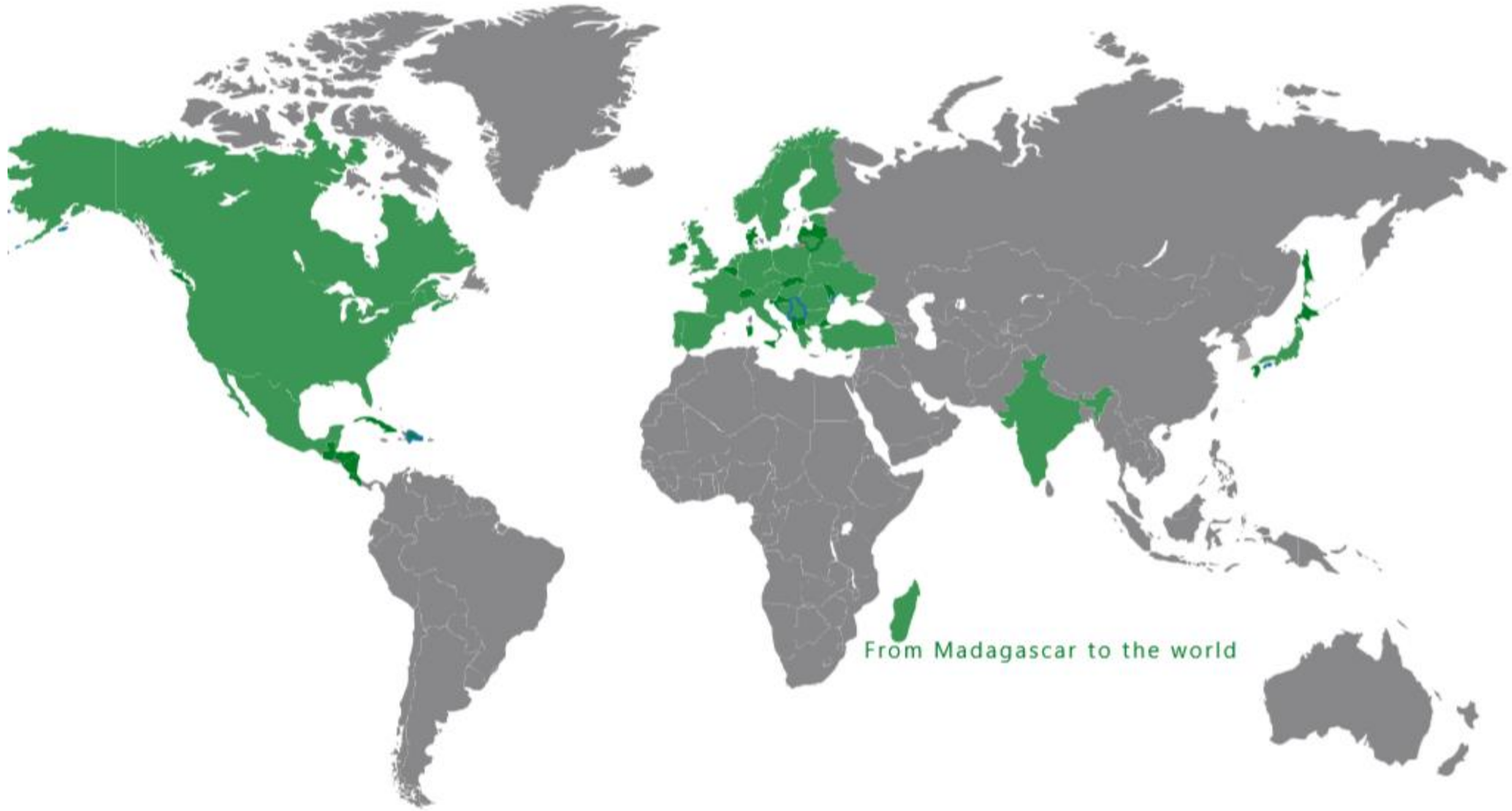
- Environmental sustainability
- Develop sustainable Relationships
- Ensure sustained Value Creation

- Improving quality of life of the people associated.
- Contribute to a sustainable globe.
- Follow ethical practices in all spheres
- Excel in Technological advancements
- Engage with the community and stakeholders.

# Worldwide Network

Due to our experience in the industry, Tirupati has a strong reliable reputation and relationship with an international network of customers and partners.

TIRUPATI®
GRAPHITE



# In Brief

A few punchlines

TIRUPATI® GRAPHITE

- **Quality of Asset – High Quality, World-Class, Long Life Deposits**
- **Booming Sector – Multiple High Growth Consuming Markets**
- **Very Low CAPEX and OPEX**
- **Primary, Downstream and Graphene – Fully Integrated end to end**
- **Investment in Asset, not in risk**
- **Near Term Production, already cash flow generating**
- **Proven expertise in all spheres of the business**

# Our Board

**SHISHIR KUMAR PODDAR, Executive Chairman & Managing Director**
Considerable experience spanning 25 years+ developing projects and working in the graphite industry from operations to supply. A member of the National Board for MSME as a Special Invitee, Government of India with wide contributions in the sphere of industrial policy and development, has delivered keynote addresses in various forums like The Parliamentary Committee for Industries, India. Significant expertise within financial analysis and project construction, the key driver for the present and planned projects

**CHRISTIAN DENNIS, Non Executive Director**
**Based in London,** Christian has over 20 years' experience in the London financial and capital markets. He has been in the field of Investment Banking and Broking for more than 20 years and is widely connected to a varied set of investor base in London, Europe, Australia and beyond. Christian has played a pivotal role in structuring acquisitions and progress of the Company's business model.

**HEMANT KUMAR PODDAR, Non Executive Director**
Hemant has 27 years of experience in the flake graphite industry reinforcing the Company's vision to be a leading producer of flake graphite.
Contributed extensively to development of trade and industry with continued involvement in trade bodies and representation in various forums.

**RAJESH KEDIA, Non Executive Director**
Based in London, Rajesh has over 15 years of experience working in investment banking and investment management with extensive experience in mergers & acquisitions and capital raising. He has advised many companies on their growth plans and raising capital on the London Stock Exchange. For the past five years, he has been working with UK Government Investments Ltd as an Assistant Director.

Shishir Poddar
Executive Chair &
Managing Director

Hemant Poddar
Non- Executive Director

Christian Dennis
Non-Executive Director

Rajesh Kedia
Non-Executive Director

# Forward Looking Statement

All statements of opinion and/or belief contained in this Presentation and all views expressed represent the directors' own current assessment and interpretation of information available to them as at the date of this Presentation. In addition, this Presentation contains certain "forward-looking statements". Generally, these forward-looking statements can be identified by the use of forward-looking terminology such as "expects", "expected", "budgeted", "forecasts", "opportunity", "potential", "plan", "future", "seek", "will", "estimate", "may" and "anticipates". Forward-looking statements, whilst based on management's best estimates and assumptions, are subject to risks and uncertainties that may cause actual results to be materially different from those expressed or implied by such forward-looking statements. Accordingly, readers should not place any reliance on forward-looking statements. The reader is cautioned not to place reliance on these statements or views and no responsibility is accepted by the Company or any of its directors, officers, employees or agents in respect thereof. The Company does not undertake to update any forward-looking statement or other information that is contained in this Presentation whether as a result of new information, future earnings, or otherwise. Neither the Company nor any of its shareholders, directors, officers, agents, employees or advisers take any responsibility for, or will accept any liability whether direct or indirect, express or implied, contractual, tortious, statutory or otherwise, in respect of, the accuracy or completeness of the information contained in this Presentation or for any of the opinions contained herein or for any errors, omissions or misstatements or for any loss, howsoever arising, from the use of this Presentation. No reliance may be placed for any purpose on the information or opinions made or given in this Presentation or the completeness, accuracy, or fairness of the Presentation.

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