



3rd International Symposium on Asphalt Pavements & Environment

16 AUGUST 2015, SUN CITY, SOUTH AFRICA



ISAP Technical Committee APE "Asphalt Pavements and Environment"

Manfred N. Partl

Empa, Swiss Federal Laboratories for Material Science and
Technology, Duebendorf, Switzerland &
KTH, Royal Institute of Technology, Stockholm, Sweden



Outline

- General Info
- Working Groups
- Motivation
- GAP-Materials
- Goals of ISAP TC APE
- Research Topics for TC APE...
- Achievements/ Output
- Ongoing Actions
- Web Page



General Info

- Established 2008, <http://www.rknet.it/isap/>
- Annual Meetings at TRB (ISAP day)
- Sister of ISAP TC's:
 - Constitutive Modeling (*T. Scarpas, TU Delft*)
 - Pavem. Field Eval. (*E. Dave, Univ. of New Hampshire*)
- Organization
 - Chair: Manfred N. Partl (*EMPA & KTH*)
 - Secr.: Gabriele Tebaldi (*Univ. of Parma & Florida*)
 - Actual Members: 28
 - Actual Working Groups: 7



Working Groups

WG 1 Hot Recycling of RAP

Chair: **Elie Hajj** (*U. Nevada*)

WG 2 Cold Recycling of RAP

Chair: **Kim Jenkins** (*U. Stellenbosch*),

Secr: **Alessandro Marradi** (*U. Pisa*)

WG 3 Life Cycle Assessment

Chair: **John Harvey** (*U. California, Davis*)

WG 4 New Technologies & Special Environmental Aspects on Asphalt Pavements

Chair: **Gordon Airey** (*U. Nottingham*),

Secr: **Ellie Fini** (*NC A&T State U.*)



Working Groups

WG 5 Shingle Recycling

Chair: **Gerry Huber** (*Heritage Research Group*)

WG 6 By-products & Secondary Materials

Recycling in Asphalt Pavement

Chair: **Marco Pasetto** (*U. Padova*),

Secr: **Zhanping You** (*Michigan TU*)

WG 7 Energy Harvesting

Chair: **Wayne Lee** (*U. Rhode Island*),

Vice Chair: **Rajib Mallick** (*WPI*),

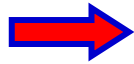
Secr: **Linbing Wang** (*Virginia Tech*)



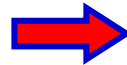
Motivation

Promote Sustainable Development

- Do NOT live **at costs** of future generations



**Don't rob
your kids!**



**Otherwise...
... Bye Bye !!**

- Live even for the **benefit** of future generations (if you know what it is)! **Turn sustainable to extra-sustainable**
- Care for **resources & environment**



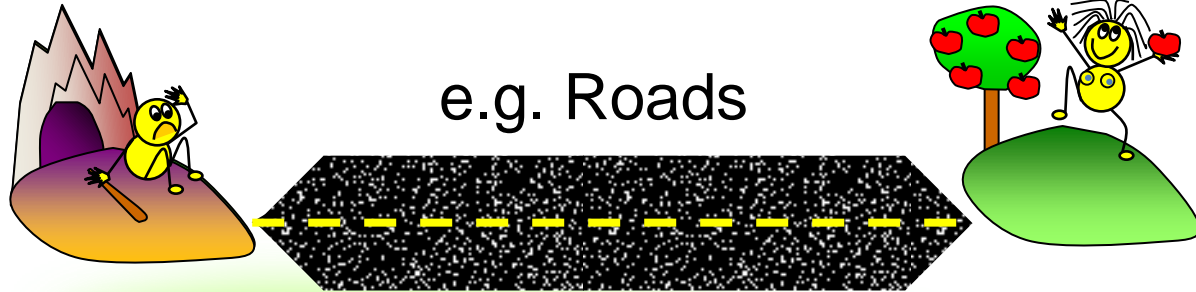
Motivation

Sustainable Development means

- **qualitative** NOT quantitative growth



Qualitative growth needs connections & mobility



No Roads =
No Economy & No Prosperity
= No Sustainable Development



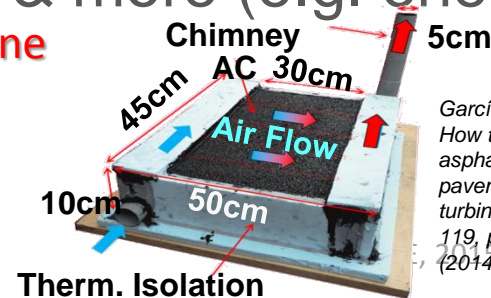
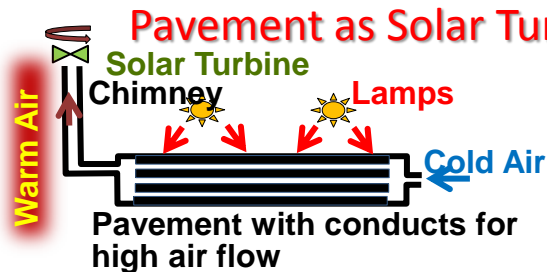
Motivation

Quantitative questions regarding qualitative growth:

- How much mobility do we really **need** & can we **afford**?
- Should/can we reduce towards a more local **way of life**?

For Asphalt Roads qualitative growth means

- Less maintenance, less material resources, less energy consumption, etc → **GAP Green Asphalt Pavements**
- Resilient against exceptional events (from climate change)
- Multi-functional use: drive & more (e.g. energy harvest.)



García A., Partl, M.N.
How to transform an asphalt concrete pavement into a solar turbine, Applied Energy 119, pp431-437, (2014); Sun City, SA



GAP-Materials

Material Concepts for Preserving **Material Resources**:

- Recycling of Pavement Mat.
 - Re-Use old **Pav. Mat.** in new pav.
(avoid: **Downcycling !**)
- Re-Use of Waste Materials
 - Re-Use **Non-pav. Mat.** (demol. & indust. waste...**no linear landfill!**)
- Marginal Materials
 - Use of available **Low Quality In Situ** materials



RAP (hot, warm, cold)

Roofing Shingles



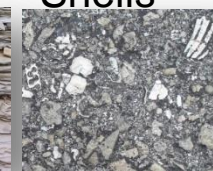
Tire Scrub



Shale



Shells



GAP-Materials

Material Concepts for **Material Improvement**

- Substitution of Materials.
 - **Replace** traditional compon. (e.g. bitumen ↔ polymer)
- Adaptive Materials
 - **Smart** mat. ("self-healing")
- Combined Materials
 - **Compose** traditional mat. for pooling different properties

Incin. Slag



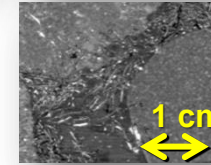
Expanded Clay



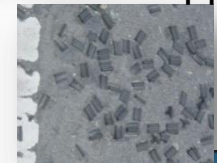
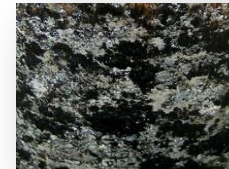
Glass



Steel fibers (induction)



Bitum-Cement Rubber-Chipping



GAP-Materials Questions

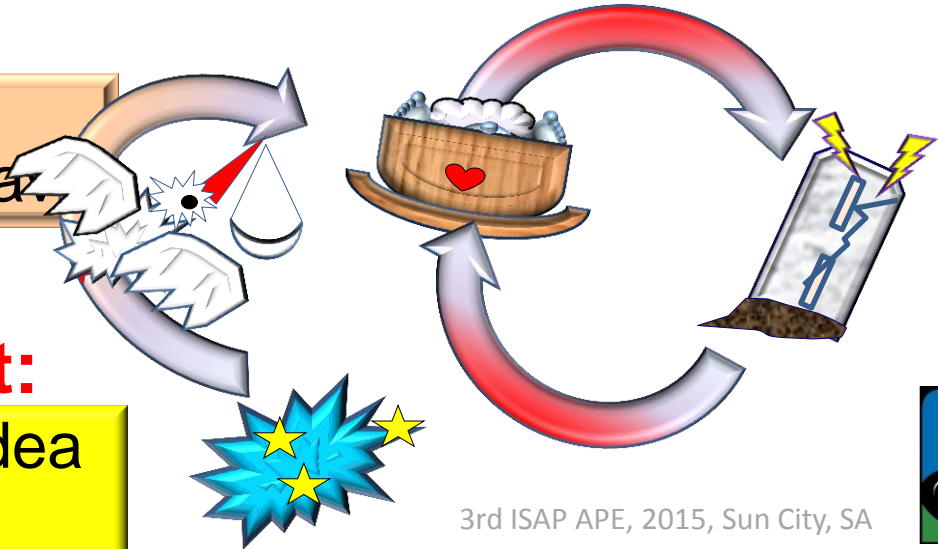
- Requirements?
- Long-Term Performance?
- Production & Application Technology?
- Availability?
- Environmental Impact?
- Health?
- Acceptance (Public-Politics)?
- Costs?
- Re-Use?
- Life Cycle ?



Goals of ISAP TC APE

- Find new solutions & new techniques to improve the **environmental compatibility** of asphalt pavements
- **Holistic approach**: Improve the state of practice of **LCA** for enhancing the environmental sustainability of asphalt pavements

LCA:
From Cradle to Grave



What about:

Tools: From Idea to Cradle?



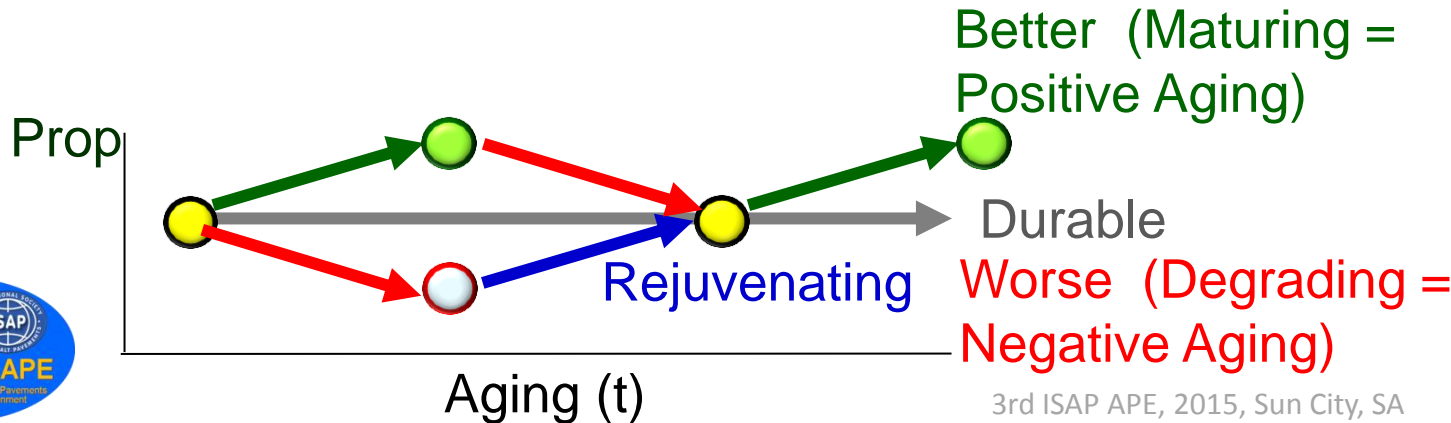
Goals of ISAP TC APE

- Promote **recycling-asphalt** as sustainable material of high value by considering technical, environmental & economical aspects.
⇒ Re-use as much as possible at quality levels as high as possible.
- Promote safe & beneficial **re-use of secondary material** in asphalt (e.g. shingles, other selected waste)
- Promote safe & beneficial **use of marginal materials** in asphalt



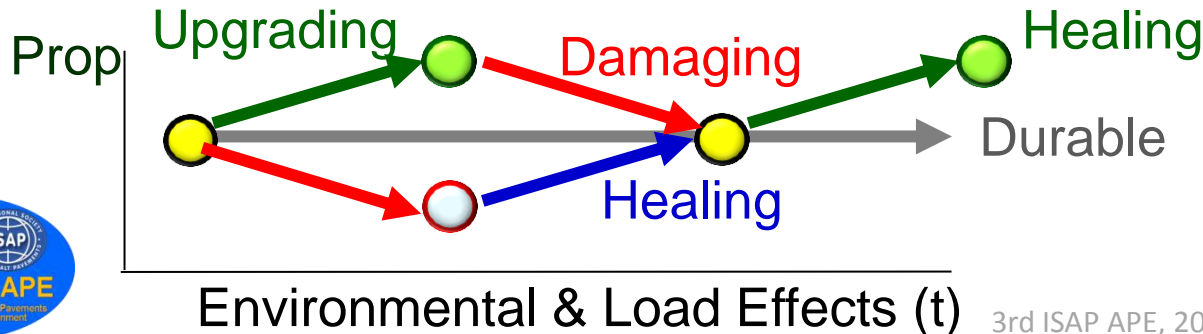
Goals of ISAP TC APE

- Find new solutions & new techniques for asphalt pavements to **improve environment** (e.g. multi-functionality)
- Find new solutions & new techniques to **understand & handle material** behavior due to
 - aging: durability, **maturing**, **degrading**, **rejuvenating**



Goals of ISAP TC APE

- Find new solutions & new techniques for asphalt pavements to **improve environment** (e.g. multi-functionality)
- Find new solutions & new techniques to **understand & handle material** behavior due to
 - aging: durability, maturing, degrading, rejuvenating
 - environmental & load effects: **healing**, **damaging**,



Goals of ISAP TC APE

- Find new solutions & new techniques for **resilient asphalt pavements** enduring extreme climatic & weather changes:
 - Freezing & Snow
 - Melting Perma-Frost
 - Flooding & Heavy Rain
 - Heat (Forest Fires)
 - Land-Slides & Rock-Fall



Example:
Flooding Tunisia



Example:
Land-Slide & Heavy Rain
Oeschgen Switzerland

3rd ISAP APE, 2015, Sun City, SA



Goals of ISAP TC APE

- Care for links with other internat. groups (e.g. **RILEM** TC 237-SIB, 241-MCD, TC 252-CMB, & new TC RAP on Recycling)
- Care for internat. discussion, standardization, research directions & professional formation through **dissemination**
 - APE Symposia ca. every 3-4 years,
 - Special APE sponsored sessions during ISAP Conferences,
 - Workshops in connection with partners,
 - Web, Webinars
 - Publications (Journal Papers, STAR)
 - Alliances with AAPT, RILEM,...



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Research Topics for TC APE...

- **Material**
 - Asphalt **production** technologies
 - **High-rate** recycling (performance and equipment)
 - Perpetual **repeated** recycling
 - **New** recycling technologies
 - **By-products & secondary** materials (mix design, mech. prop., temp., emulsion type, pav. design, constr. Tech., in-place, in-plant,...)
 - **Alternative** binders, vegetal additives
- **Construction**
 - **All-weather construction** (very low temperature, rain)
 - **Pre-fabrication** (durability & quality increase)
 - **In situ automatization** (reduced construction time, durability & quality increase)



Research Topics for TC APE...

- **Performance**
 - RAP in relation to **durability** and structural stability
 - **Moisture** damage
 - **Aging** (mechanism and laboratory techniques)
 - **Interaction** structure & performance
- **Environment**
 - **Energy saving** & warm/half-warm & cold recycling (mix design, mech. prop., temp., emulsion type, pav. design, constr. Tech., in-place, in-plant,...)
 - **Emissions** (fume, water, CO₂)
 - Asphalt pavement for **energy production** (solar, thermal,..)
 - **Noise** reduction
 - Unconventional **multi-functionality** (e.g. photocatalytic effects, self healing, self de-icing)



...Research Topics for TC APE

- **Life Cycle Issues**
 - **Life cycle assessment** tools
 - Life cycle cost analysis of **new** technologies
 - Sustainability of **construction & maintenance** of asphalt pavements
 - Environmental **restorations** of abandoned alignments
- **Implementation**
 - Strategies to **awaken** Road Authorities toward sustainable asphalt pavement
 - Development of **common standards/guidelines** across the world

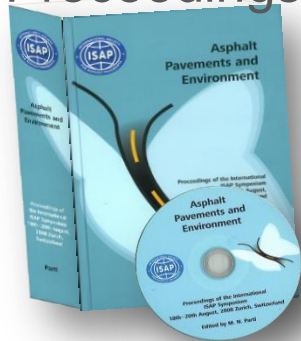


Achievements/ Output

- Symposia
- Dissemination through individual WG's
- Proceedings, Special Issues, STAR

Publications

Proceedings



Special Issues
RMPD



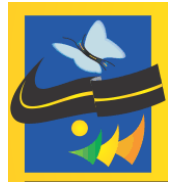
2012: Cold Recycling
2014: Fortaleza Sympos.

Symposia:

2008
Zurich
Europe:



2012
Fortaleza
S. America:



2015
Sun City
Africa:



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Achievements/ Output

- APE Sponsored Session at ISAP Conferences
 - 2010 Nagoya (2 sponsored Sessions)
 - 2014 Raleigh (1 sponsored Session)
- Summary Info during
 - ISAP (@TRB), AAPT, and RILEM annual meetings
- Workshops organized by WG's (examples):
 - VARIREI, AMC, Pavement LCA Davis & Nantes, SIIV, MAIREPAV, EATA, CAPSA, ISAP, AAPT, RILEM,...
- ISAP Day @ TRB (example 2015):
 - Recycling in Germany - A Cannone Falchetto.pdf
 - RAP-RAS in Texas - F Zhou.pdf
 - Sustainable Materials - R Williams.pdf
 - Energy Harvesting - K Wayne Lee - part 1.pdf



Ongoing Actions

- STAR
 - WG2 "Mix Design of Cold Recycled Mixtures with RAP"
 - WG6 "The use of marginal (by-products and secondary) materials in asphalt pavements"
- Individual work of WG's following their strategic plans
- Other WG's ?
 - Discussion on other topics (proposals welcome), such as
 - Resilient pavements,
 - All-weather construction
 - Healing
- Preparation of ISAP Day 2016
- Call for 4th International APE Symposium
 - Asia/ India/ Middle East?



Web Page

<http://www.rknet.it/isap/>

ISAP Technical Committee
Asphalt Pavements & Environment

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TC Board



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Tel: +1 65 293-9188, Fax: +1 65 293-9193, Email: Secretary@asphalt.org

Environmental issues and sustainable development are key factors where asphalt pavement technology can play an even more positive active role in the future. Asphalt is ideally suited for recycling and re-use of materials, meeting the challenges of limited material resources. It has potential to reduce global warming through low energy concepts for mix production and placing. Furthermore, it allows meeting specific environmental demands of denser populated agglomerations, such as reduction of traffic noise by introducing new innovative materials and designs as well as reductions of congestion from road works by improving durability and aging resistance. Hence, it is now time to establish a holistic way of approach and introduce this concept in life cycle analysis as well as research and development.

In order to form a coordinate platform for progress in this field and based on the achievements of the Symposium ISAP2008 August 18th to 20th in Zurich (<http://www.empa.ch/isap2008>) a new ISAP Technical Committee TC APE Asphalt

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Thank You !

